RAILROAD GAZETTE

FRIDAY, JUNE 15, 1894.

CONTENTS.

The office of the Railroad Gazette is now at 32 PARK PLACE, New York.

Contributions.

Coil Springs for Passenger Cars.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Is it possible to make a good riding passenger car with coil springs only, and what is the theoretical difference between the coil and plate spring for this purpose?

SPRING MAKER.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have noted with interest the description of Mr. Gibbs' spiral spring controller in your issue of April 27.

I am glad to see that a movement is on foot for the introduction of spiral springs to a greater degree as bolster springs. One trouble with the spiral spring is its comparatively short bar and quick pitch. Some years ago I designed a form of spiral spring, based upon the principle of having all the bars the same length, thus giving the same pitch and the same motion, but not expecting the bars to carry as nearly the same weight as had been the case previously. We found, in the early history of spiral springs in this country, that the inner coils broke very often because they were made of shorter bars and had a higher pitch, with consequently a higher strain upon the metal when the springs were closed. I believe that a spiral spring of large diameter, with a long bar and easy pitch, would give us very good results as a bolster spring for passenger equipment, and at a much less cost than the elliptic. A bar could be used, say 150 inches long, which would give a very easy slow motion.

In this connection I would say that spring testers, as generally constructed, are upon a wrong principle; the weight lever is rested upon the top of the spring, and when moved the vibrations of this lever, whether fast or slow, are considered as an index of the value of the spring. A properly designed spring tester should have the weight lever as now, but the motion to the spring should be given by a cam movement at the bottom, pressing the spring from the bottom up, which is the nature of the shock found in practice. The best spring, then, would be the one that would stand the greatest amount of shock at the bottom with the least amount of motion on the part of the weight lever at the top.

C. M. HIGGINSON.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Replying to the enclosures regarding the possibility of using coil springs, instead of elliptic, on passenger equipment, I have never been very sanguine that this would be a wise move. The American standard passenger truck, I think, has an excellent spring arrangement, that is, a combination of elliptic and spiral springs, and both of these classes, it seems to me, are necessary for the most perfect results in ease of riding. The peculiarity of the elliptic spring is its long vibratory period, which corresponds to the long oscillations of a car body, due to defects in track, etc. In other words, an elliptical spring will accommodate itself to the period of oscillation of the body, whereas spiral springs cannot. Of course, there can be no absorption of oscillation without response of the springs. The remaining class of vibration, due to sudden shocks, requires a short vibration period to spring to absorb them. This is furnished by the spiral equalizing springs.

It will thus be seen that a combination of the two is essential to the best riding results. Now the question remains whether two kinds of spiral springs might not be used in a truck, one with a short vibration period and one with a long. I see no theoretical obstacle to this, but I believe it would be practically impossible to enlarge the dimensions of a coil spring sufficiently to accomplish the result.

Mr. Higginson refers to the description of a spring motion dampener designed by me; this was specially designed in combination with spiral to imitate the motion of a short elliptic spring, such as is found under locomotive tenders and stock cars, and it does so very successfully. The objections to these short elliptic springs are several: first, their high cost; second, their heavy breakage, this latter being due to the limited dimensions of a freight truck which forbid the introduction of a well designed elliptic. It is possible this dampener would work successfully in passenger trucks, but I do not think there is great call for a change from the present elliptical springs. These are, of course, somewhat expensive, but they last the lifetime of a car and the number in use on any road does not constitute a very severe tax.

GEORGE GIBBS.

[Some experiments were outlined by the Chicago, Burlington & Quincy looking toward the introduction of coil springs under suburban coaches. Figs. 1, 2 and 3 show the design proposed. The springs were intended for light coaches, the body weighing 28,600 pounds, and two 4-wheel trucks 18,800 pounds, making a total weight of 47,400 pounds. The specifications for this spring were as follows: Four springs

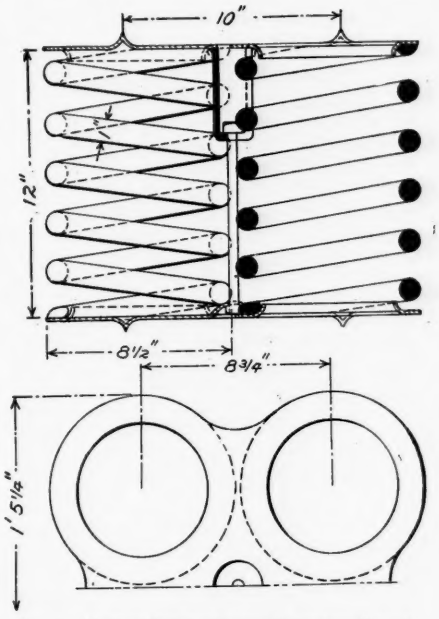


Fig. 1. Helical Bolster Spring Suburban Coach.

in a nest each of a single coil, 8½ inches outside diameter. Bar 1 inch diameter and 141.4 inches long. Weight of each coil, 31.1 pounds. Heights, free 12 inches, solid 6 inches. Total capacity, 15,400 pounds to stand 8½ inches high under load of 9,000 pounds. —EDITOR RAILROAD GAZETTE.]

Fig. 2,

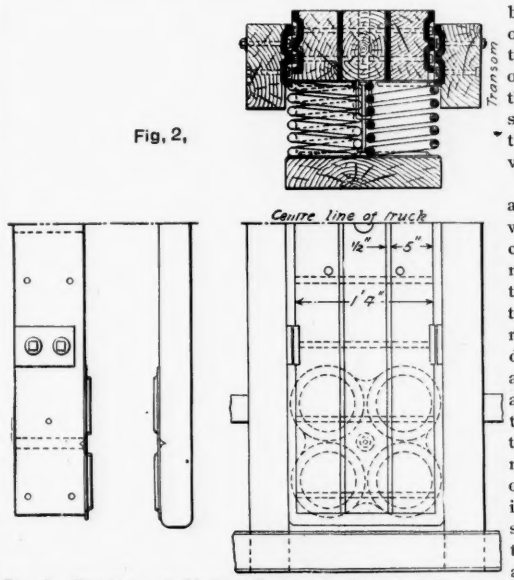


Fig. 3. Bolster with Helical Spring for Suburban Coach.

The London Underground Railroads.

LONDON, May 30, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I read with great interest the article in your issue of the 18th inst., entitled "Metropolitan Railroads of New York and London," and as an Englishman and Londoner would like to compliment the writer thereof upon his knowledge of the exceedingly complex railway system now operated within the London area.

There are, however, just one or two points which may, perhaps, be touched upon by way of correction, though these are only details which do not in any way affect the sum and substance of the article or the conclusions at which it arrives. With these I thoroughly agree; but as a matter of accuracy would like to say that it is hardly fair to include in the underground system of London the entire length of the Metropolitan Railway, viz., 67 miles. Probably more than half of this distance lies right outside London altogether, stretching away in the northwest towards Aylesbury, and parallel in direction almost with the London & Northwestern main line. This country extension of the Metropolitan will eventually form part of the new trunk line to London from the Manchester, Sheffield & Lincolnshire system in the North, Parliamentary powers having already been obtained, and capital alone being required for completing the scheme. It is on this outside portion also that the single track is found. London railways—whether underground or overhead—are, at least, double track, if not more. Of course the line will be doubled when completing the trunk railway.

Secondly, it must not be thought that the great main lines actually run their through trains upon the underground lines into the heart of the city. What is done is to stop the expresses just outside the London terminus at important junctions, where tickets are taken, and from these junctions services of suburban trains run to all quarters, and on the undergrounds right into the city. Instances of such junctions are Willesden, on the London & Northwestern; Kentish Town, on the Midland; Finsbury Park, on the Great Northern; Clapham, on the Southwestern, and so on. At the same time, most of the big railway termini are close to the underground lines, and passengers do not have to walk far. If they have baggage it is often more convenient to change from the express trains outside London, and make connection at the junctions as above mentioned.

I note one little error in the article; the London, Brighton & South Coast has no station in the city whatever, much to its disadvantage. It is the London, Chatham & Dover which runs into Holborn Viaduct and makes connection with the underground lines also, thereby getting to Moorgate street and Kings Cross. The L. B. &. S. C. is about the only main line which has no city station now, for London Bridge terminus is on the south side of the river. Even Waterloo will have its city extension before long, and I hope to send you some details of this with a map which will show the relative positions of the new electric underground lines, and the great termini of the steam railways.

FRANK B. LEA.

Cast Iron vs. Forged Soft Steel Brake Shoes.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The question as to what metal is best adapted for use for brake shoes is of vastly more importance than one would suppose, if only a passing thought be given it. The main points to be considered in deciding the question are: First, economy in wear, considering the first cost of each; second, relative wear of wheels; third, the co-efficient of friction or retarding power.

It has been demonstrated by tests in service that one brake shoe made of forged, soft, low-carbon steel will outwear about seven cast-iron shoes; or, in other words, the wear is one pound of soft steel shoe to eight pounds of the cast-iron shoe for the same service. This answers the first question to be considered in favor of the soft steel shoe, because the cost of it per pound is but three times that of cast-iron, while the demonstrated practical value is eight times.

The second proposition is the relative wear of wheels, and there has been room for doubt whether the soft steel would not wear the wheel faster than cast-iron; this doubt comes from the fact that friction has generally been connected with wear, the assumption being that the greater the wear the greater the friction, but this is now known to be dependent upon the nature of the material. The results, from a long period of tests, show that soft steel does not wear steel tires or chilled wheels any morethan, and not as much as, cast-iron shoes. The reasons for this are obvious: The steel shoes to wear the wheel faster than cast-iron would have to be harder, but the fact is they are softer, having only 0.10 carbon. The question naturally arises, if the steel is softer, how is it that it only wears one-eighth as fast as cast-iron? The answer is simple, and embodies the secret of the economy of the soft steel shoe. Soft Bessemer steel is homogeneous, and the molecules, although soft, hang tenaciously together and resist separation, so that they are not readily pulled apart by the friction, thus reducing the wear. Cast iron, on the contrary, is not homogeneous, and the molecules are not held together with anything like the force that exists between the molecules of soft steel, and the particles separate easily and fly off, just as the particles fly off from emery wheels. In other words, the real cause of the excessive wear of cast-iron shoes is the waste occasioned by the separation of the particles from each other, and the falling off without having performed any really useful function in braking.

The third question about the co-efficient of friction, or retarding power is one that is still unsettled. The reports of tests show that the retarding power of the soft steel is as great as, if not greater than, that of cast-iron. Yet we

can easily see how the retarding power would not be as great with hard steel shoes as with cast-iron, but on this point it is well to wait for the data from the M. C. B. committee on laboratory tests before going too far in reaching a decision as to the co-efficient of friction.

Besides other incidental advantages of the long-wearing, soft-steel shoe, there is the all-important one of the less number of times the shoe has to be changed, and the decreased inspection required to keep up the slack.

CHARLES T. SCHOEN.

Concerning Locomotive Boiler Construction.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read the recent discussion on locomotive boiler construction at the Southwestern, New York and other railroad clubs, and having just finished a trip during which I have visited the prominent locomotive works and railroad shops, I send you a few notes.

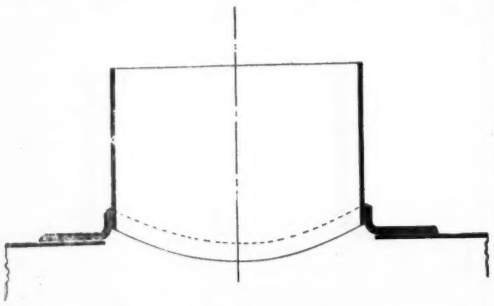
In recent discussions it has apparently been felt that the slipshod methods of inspection common to many railroad repair shops were too pointedly attacked. Probably some felt that such a complete system as has been advocated would entail more personal work and supervision.

What has been said about the difficulties and troubles encountered in properly staying from crown bars to the roof is true. In many boilers some of those braces are not more than from 4 to 6 inches long between centres of pin holes, and as such short braces cannot be handled hot in the small space over the box, they are put in cold. Once the braces are all in, on the crown bar type of boiler, very few of them can be reached for inspection, as the braces coming from the back head prevent any *man* (boys might) approaching the back end. The turnbuckle brace made by the Pittsburgh Locomotive Works under the Wightman patent, is a most excellent one.

About stay-bolts,—I do not think I should favor using bolts so large as to do away entirely with the bending action of the bolt, but rather favor some method of distributing such action over a greater length. The bolt would have to work and become loose in the thin inside sheet, or the sheet itself would waste away from repeated bendings, as was shown by Mr. D. L. Barnes in his paper before the New York Railroad Club, that is, if the bolt was out of proportion to the thickness of the *inside* sheet. I am of the opinion, though I have never known of such large bolts being tried, that the proper way to solve the broken bolt difficulty is to make bolts that will be flexible, say by turning them down in the centre between sheets. It would be expensive to make boilers with such bolts, but would not cost as much as renewals and delays with present methods.

It has been said that "A solid screw stay should never be used without a tell-tale hole." If this was meant exactly, I must take exception to it. Radial stays, the crown and long cross stays of Belpaire boilers and the long stays between crown bars should be exceptions. It is very expensive to drill most of these, and the chances of their breaking are small;—at least I have never heard of their giving trouble.

Referring to dome connections, it is surprising that the really first-class connection shown by the engraving has not been advocated. I know that it has been favorably



thought of. The base must be formed in a press such as is made by the Fox Pressed Steel Company, the Pittsburgh Locomotive Works, the Pennsylvania Railroad and others. By using plate of the proper thickness, and making the connection as shown, the strength of the whole can be made equal to the solid plate. All the rivets are driven with the machine, insuring a good joint with heavy material. It has been found hard in practice to make a satisfactory job when the three thicknesses, roughly flanged by hand, had to be brought together and the rivets driven by hand. In my opinion the dome attachment is the weakest and most dangerous point in boiler construction. This is specially true with the radial stay and Belpaire types, in which the dome is generally placed upon a course of large diameter, and cannot be stayed to anything beneath. On such boilers domes are more liable to breakage than when placed over the box and braced to the crown. The 5½ by ¾ inch ring below the dome does not add greatly to the strength of the construction, but only to the stiffness. In most cases such rings are made of iron, but even when made of steel the strength across the centre is not great when three holes 1 inch in diameter are punched or drilled in a zig-zag line. The collar, shown in the engraving, of ⅝, ⅞ or 1 inch steel is much better.

In Mr. Barnes' paper, under the classification of boilers for inspection, ⅜ inch is allowed for departure from circular form in first-class boilers. This, I presume, is a typographical error, as only ¼ inch is allowed for second class. It strikes me that ⅛ inch is very little to allow for change in shape under pressure, and that very few boilers so far built would pass into class 1 under that requirement.

I consider a liner on the back head, such as has been advocated, almost absolutely necessary on a boiler with crown bars, owing to the large area which cannot be directly braced. On the Belpaire and radial stay types a back head can be well braced without such additional stiffening. A good point recently discussed is the examination of the shell every time the jacket is removed.

If a first-class boiler is built under a rigid system of inspection, and the most approved methods of construction, with a factor of safety as high as 5, I cannot see why an inspection of stays and braces is required every six months. It would be well to examine such a boiler at the end of the first six months, but after that once a year, or even once in two years would, in my opinion, be enough. Braces large enough to give a factor of safety of seven, with attachments of equal strength, should be in good condition at the end of the life of the boiler. If put in tight they should not rattle loose nor should pins of ample size wear or cut.

Regarding hydraulic tests or steam tests somewhat above the normal pressure, it is of no value to determine the bursting pressure, yet I have often found such a test of great value, inasmuch as very often weak places not suspected are shown up, which, though perhaps not actually dangerous at the time, would become so if not attended to. I am very much in favor of a steam test one-half in excess of the working pressure; such a test on a boiler can do no harm, that is, if the boiler is good.

I prefer to have the hammer test of the stay bolts made from the outside, for the reason that the largest number of bolts are broken close to the outer sheet. This leaves only a short piece of metal to hammer on, and the sound will be much more "hollow" than if the hammering is done from the inside. Once a month is of enough to test stay bolts, as they break very gradually, and the method of renewing them by taking out the surrounding ones, keeps one better posted on the condition of those bolts that are exposed to the greatest strain.

The radical stand recently taken for improved construction and inspection cannot fail to accomplish great good. Some seem to have been so surprised by the recent strong recommendations for better boiler practice that they have lost their wits and have said some nonsensical things. There is no subject in connection with locomotives that needs more attention now than the boiler construction; at least I find this is the opinion of some who have been intimately associated with some of the recent failures of locomotive boilers.

JAMES L. SPIERS.

Steel Freight Car Truck Frames

BY AN ENGLISH ENGINEER.

"The compressed steel frame is gradually superseding the 'American' diamond bogie system in United States railways," is the originally worded, if not strictly accurate, statement with which an English railway paper concludes its article on the industries of the pressed steel frame trade. For many years your National Association of Master Car Builders has tried to standardize certain parts of freight car construction, and it was understood, if not agreed, that the diamond form of rigid truck was the simplest, cheapest as to first cost and repairs, and generally the most desirable. By far the majority of freight car trucks were built on this principle, notwithstanding the merits of the Thielson and swing beam systems, which have their advocates. With these facts in mind it seems strange that the results of operating, covered by the years of the existence of the Master Car Builders' Association should be set aside and a return made to the primitive form of construction of George Stephenson's time, *i.e.*, the axle box inclosed in horn plates. But if the moving axle box was the most economical, why was it abandoned? Is it not a fact that the friction of the axle boxes working in the guides soon wears the box and guide to such an extent as to cause a disastrous effect upon the brass and journal every time the brake is applied? Is it not also a fact that instead of axle boxes lasting indefinitely, as in the rigid diamond frame, they soon wear themselves out in the horn plates or axle box guides, and at the same time wear out the guides themselves? It may be answered that passenger car trucks are for the most part constructed on the sliding box system; but this would be but an evasion. In your M. C. B. standard passenger car axle box and axle box pedestal, you have provided a chilled frictional surface of 8 ins., Fig. 1. If an ordinary horn plate surface, such as the pressed frame presents, 3½ ins., Fig. 2, of soft metal, was sufficient, why did it take the M. C. B. Association years to progress up to the present form? None of the new systems' advocates would pretend for a moment to argue that passenger cars receive the hard usage that freight cars do, nor will they forget the system of equalizers and springs used in the passenger trucks which help to overcome the excessive wear mentioned.

Trouble will be found with the brakes on the pressed frames after a short time. The brakes will be applied when the box is in one position and the first low joint or inequality in the rails the wheel strikes will cause a shifting of both the axle box and the brake shoes, and the brake is no good until reapplied. There is no means of hanging the brake shoes in a uniform position as regards the wheels, no matter whether the brakes are inside or outside hung. It is a well known fact that a large proportion of the so-called unexplained derailments of freight trains are directly attributable to brake beams torn off and falling upon the track. It has been frequently admitted by the most advanced operating officials that the system of hanging brakes, that are acted upon, after they are applied to the wheels, by the motion of the bearing springs, is wrong in principle and practice.

It has been the aim of the railway mechanical associations to reduce to a minimum those parts of freight car trucks for which special patterns of material are required. But suppose your Eastern line loads a car, having pressed frame trucks, at New York for St. Louis or Omaha, and during transit it meets with a slight derailment, and one of the frames is bent or broken, will not the goods have to be transhipped and the car sent to the nearest shop on a temporary truck? Will it not lie there

Fig. 1.

Fig. 2.

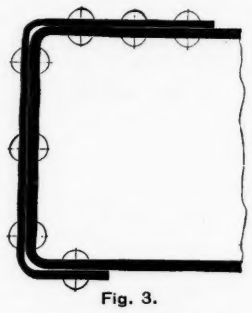


Fig. 3.

until the owning road can be written to for a new frame, and until it in turn sends orders to the "pressers" to make one and forward it? It may be said an ordinary derailment would not injure the frame. What will those who have had experience with the Thielson or channel bar truck with riveted ends say to this? In the pressed frame, you have two cross channels butting end on to the side frames and these are held only by knees formed of their ends through which is passed a rivet or two (Fig. 3). When all is new, there may be only usual play of journal in the brass; but when the axle box and its guides wear, and the collar and shoulder of the axle wear the brass, the result of running over frogs and switches and around curves soon puts an end to the life of your rivets, and your truck has simply to drop off the track to get out of shape.

It may be asked why the damage resulting from derailment should enter as a factor in a discussion of what is required of a freight car truck? The answer to such a question would be that for many years to come railway operations must be largely over lines that are imperfect. The class of derailments spoken of occur by the hundreds every day, especially in yards, where as a rule sidings are bad. As railways improve it is a question if the matter will not become worse for the riveted truck frame. Car builders have in the past, and are likely in the future to be the branch required to respond most promptly to the demands of traffic departments for facilities to transport larger loads in quicker time. The maintenance of way engineers cannot so rapidly change existing conditions. What often holds them back is that their work is largely labor, which must appear in the accounts as cash withdrawn from current receipts and not as in the case of new cars which are paid for by equipment bonds or car trusts. In this way it becomes the case, especially on new lines, to find the rolling stock superior to the road bed.

It is the high speeds that follow improvements of tracks which will, far more than derailments, exercise the destructive influences referred to. A car being shifted in a side track or through a yard at 6 miles an hour, perhaps will not suffer more damage if it gets a wheel off the track than would come to it by being run for a few days at 30 or 40 miles an hour across frogs and crossings and around sharp curves. Is it not fair to insist that truck frames should be made to withstand the shocks in the line of their greatest force? In building a structure, no matter for what purpose it may be designed, highest perfection is attained when the various parts are so arranged that all unite to do the work without being entirely dependent for safety on any of the units. Thus, in building a freight car truck, care should be taken that the parts directly acted upon by the weight should so reinforce each other that a breakage of a minor part would not disable the truck. Metals are used to best advantage to withstand tension strains; and this should be borne in mind, and deflecting strains, as exerted on cross sections of metal, as far as possible eliminated. It is also a known fact that, in the operation of railways, non-elastic connections of metal are to be studiously avoided. What may we expect for the life of a structure that has its existence dependent upon a transverse section of metal mashed into right angle form, weakest where it should be strongest and held only by a few rivets upon each of its arms? Are rivets without a bearing (Fig. 3) safe to withstand the strains of compression, tension, and shearing, with a leverage many times multiplied; strains that are imposed on a structure that has nothing to hold it together but a makeshift at right angled contact of channel or its equal of sectional metal? What is the result of the use of a section of metal, without elasticity, as a bearing beam for carrying the centre plates of a freight car, when such bearing beam is riveted fast to the side frame of the truck, consideration being taken of the fact that the supports are 6 ft. apart instead of, as by the springs, in the usual manner less than 5 ft., and that the section of metal, by reason of its process of manufacture, offers but comparatively slight resistance to deflection? An inspection of this feature (Fig. 4) of the pressed sections will show that they offer only the bending

resistance of the flange, the web coming into play after the flange has been dropped below the centre of the radius of connection. Therefore, when of equal weight, they are inferior in strength to an ordinary rolled channel, with

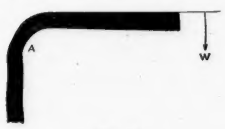


Fig. 4.

Fig. 5.

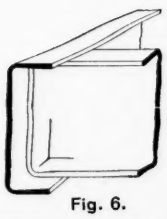


Fig. 6.

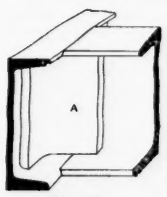


Fig. 7.

its square corner and enlarged filet (Fig. 5). The weakness of the pressed section is further seen by an inspection of the filet (Fig. 4, A), careful test having shown a reduction of area of the sheet at this point from 15 per cent. to 40 per cent. The shape taken by the sheet after pressing, renders it impossible to fit the cross channel into the side frame with the least degree of nicety, as will be noted by Figs. 3 and 6. For this reason the pressed steel frames abroad have made but little progress in competition with rolled channel sections. These permit the abutting members being machined into the frames (Fig. 7), and by using drop forged angle plates (A), which conform accurately to the contour of the inner faces of the sections, secure a fitted joint; a costly operation, it is true, but which has at least the merit of a frictional contact of the entire surfaces.

If it is assumed for argument that the journals of a pressed frame truck are well fitted, and the end wear provided against, there can be but one result when the car is loaded; the deflection of the flanges of the bearing beam must pull in the sides of the frame, to the extent of causing the journals to heat by reason of the unequal bearing on the collar and shoulder of the axle. It would be interesting to know what proportion of the pressed frame trucks in use have been run under 30 tons capacity cars; whether such cars have been regularly loaded to 67,200 lbs. and

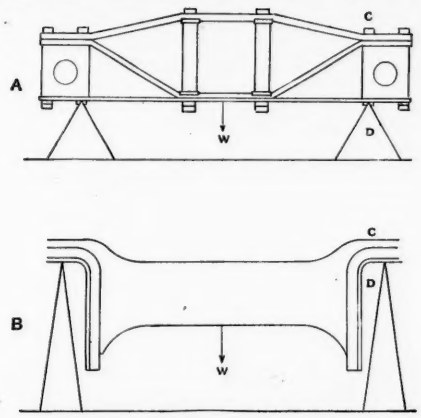


Fig. 8.

making average mileage, and what has been the percentage of hot boxes under them, as compared with an equal number of well designed diamond frames under the same class of car. A comparison of weights of the pressed steel frame with the diamond should be made at the same time; which, in order not to be misleading, should be upon net weights in each case, eliminating wheels, axles, brake beams, etc., and confined to the truck frames pure and simple.

Representations have been made that the pressed frames can be dead-weighted to an extraordinary extent fig. 8 but with an equal weight of metal in the frame and supporting the two on equal points, it only takes an examination of the sections Fig. 9, to demonstrate to a practical eye that the diamond frame would suffer no loss in a competition as a weight carrier. It is to be regretted the figures are not available for a comparative statement of the theoretical ultimate loads; because, though we are fully supplied, both by manufacturers' list and standard text books, with formulæ and tabular co-efficients for

Sections through C. D.

Areas, pressed	= 6.25	sq. ins.	
" Diamond	= 12	sq. ins.	bars.
" "	= 13⅛	" "	box.
" "	= 25⅛	" "	total, or 4 to 1.

proper channels, it is yet to be demonstrated by independent experiment how far such figures are to be reduced to afford proper data for the stretched, thin, round-cornered section offered in the pressed frame.

For the present it will do to leave the revolution in freight car truck building, as exemplified by pressed steel frames, with the note that in the proceedings of the 1893 meeting of the Master Car Builders' Association, the committee on freight car truck frames report they found 14 members of the association who were willing to answer favorably the question, "provided a pressed steel truck frame can be made as claimed, cheaper, lighter and stronger than the strongest diamond frame, do you consider the form of side objectionable?" As there are 328 members of that association the proportion is not large who are even willing to suppose that such a thing can be done.

To consider metal trucks that have recently been brought out by American designers on the lines of the "diamond" frame, it is unfortunate to be handicaped by the unwillingness of railroad officials to publish in the association's reports drawings of representative types of their best practice. As is well known, the chairman of last year's committee has given years of thought to the question; but not by one line in that report is it intimated that they found in their full year's labor a railroad's modern metal truck with sufficient originality and merit to warrant their incorporating it or any part of it, in their report. Nor, during the discussion that followed its reading, was there any recommendation made, any plan submitted for criticism, nor any model offered as "truck standard." It is in the absence of such official data that the references of another committee naturally call attention to the Harvey steel truck as typifying the most advanced diamond frame practice, and hence to examine it may be interesting.

In considering the Harvey steel truck, let it be assumed that the wheels, axles, axle boxes, keys, lids, brasses,

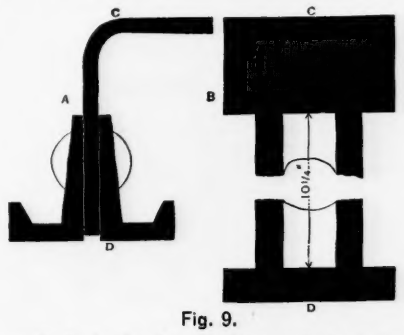


Fig. 9.

dust guards, brake heads and shoes, and the bolts, nuts and rivets for fastening those parts, are applicable to any form or make of truck. We find in the "Harvey" the following:

2 Top arch bars.
2 Inverted bars.
2 Tie bars.
2 "I" beams. Forming the bolster.
2 Bearing plates for springs.
2 Connecting plates at ends.
2 Side bearing tie plates.
1 Centre plate.
2 Idle lever guide bracket plates.
2 Angles. Forming the sand planks.
2 Bearing plates for springs.
4 Brake hanger brackets.
4 Brake hangers.
4 Brake hanger bolts or pins.
4 Safety chains.
4 Safety chain brackets.
4 Brake beam levelling brackets.
2 Brake beam levelling hangers (3 pieces each).
2 Brake beams.
2 Brake levers.
1 Spreader.
1 Idle lever guide.
1 Idle lever guide bracket.
4 Columns.
4 Slides.
1 Centre plate.
2 Side bearings.

a total of 63 pieces, to which would have to be added many times as many more for the bolts, nuts, rivets, keys and cotters required to attach and secure them. Mr. Barber's committee reported last year finding rigid trucks for 60,000 lbs. cars, which contained as a total of wheels and axles, wood and lag screws, washers, nuts, bolts, rivets, and all other parts, 85 pieces.

It will be noted that the I beams forming the bolster are so deep and thin that they will vibrate to such an extent as to cause the bolts or rivets in the centre plate to speedily work loose or crystalize and drop off. Again, by the absence of the bottom and top tie-plates for the I beams, a very much stiffer beam is required to resist the buckling under the weight than would be required if proper tie-plates were provided, or at least numerous through bolts with ferrules across the web of each beam. In the Harvey the only support for the king pin is through the short distance of its bearing in the centre plate, which must throw the strain of working across the line of the top of the bolster; and, by reason of the depth of the beams used, afford considerable leverage to buckle them or throw them out of their perpendicular, and thus destroy their value to resist the pressure of the load; nor is this strain adequately provided against by the system of columns and slides used. The latter are of very small surface and fastened very near the top of the beam. There is no aid afforded by these embracing the columns so as to distribute the shocks on all four instead of being withstood entirely by the one that happens to have its resistance in immediate line of the strain. The designer has evidently considered that the resistance to buckling should be provided for at the ends of the bolster, as he has "bent" plates riveted there, as well as plates under the springs. Why it was overlooked at the point where the strain was twice as great, *i.e.*, at the centre, would not seem to be clear.

In the Harvey design, the key note appears to be "steel;" and it is fair to assume this means rolled, hammered, or stamped steel, and not steel castings made from special patterns, but to the contrary they use:

2 Malleable casting for spring seats.
2 " " for side bearings.
4 " " columns.
4 " " for column slides.
4 " " brake hanger brackets.
1 " " idle lever guide carrier.

All are made from special patterns; and to replace the same means keeping a stock of each (which, with the present system of car interchange is a very serious expense), or else sending to the manufactory to have the parts sent to the points desired, letting the car lie out of service meanwhile.

What in service would be objectionable in the Harvey truck is that it appears to be largely built of specialties of other firms: the brake shoes, brake shoe keys, brake beams, centre plates and steel shapes are given as coming from widely scattered centres. For each of these it will be necessary to send to the makers; and, as some at least are patented articles, they will only be available from one source. Of course it is understood the ordinary shapes of iron or steel, the bearing springs, bolts, nuts and rivets, together with the parts eliminated at the outset as standard, have not been referred to.

Is it not reasonable that a truck should be so fastened

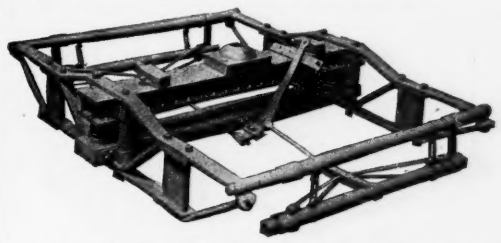


Fig. 10.—Truck for Belgian State Railroads.
Weight, with brake gear as shown, 2,016 lbs.

as to make each part in itself complete as far as possible? and not make the disarrangement or damage to one part unnecessarily affect others or the whole; *i.e.*, that a broken centre casting should not disable a bolster, a broken side bearing to be able to remain in place temporarily without endangering the strength of a bolster; a broken column or column slide not to render a bolster liable to be displaced by the shock of service; a broken spring seat in no wise to affect a spring plank disastrously.

Several months ago there were built for a South American railroad, a large number of steel trucks of which an illustration is given (Fig. 11). This design is offered as combining more of the desirable, and fewer of the objectional features of iron trucks than those heretofore submitted. A publication of its candidature as "truck standard" may induce the friends of the systems to criticise it with as free comment as has been taken with their own. From an inspection of the drawings, it will be seen the truck is of ordinary diamond frame type with outside hung brakes. The bolster being formed of two I beams (5½x4½x½ in.), a section sufficiently shallow to bring the strains of the centre plate and king pin well within their ability to resist the lateral shocks that must ensue when the cars are roughly shunted, or operated in long trains over rough roads. The beams have heavy plates 10 in. x⅝ in., riveted top and bottom, the whole forming as near as possible a solid beam of about equal size with an ordinary timber bolster. One of these bolsters was tested by the engineer of the railway with loads varying from 15 to 75 gross tons, applied on the centre of the centre plate; the beam being supported on centres 5 ft. apart, the result showed a maximum deflection of $\frac{5}{16}$ in., and a permanent set under the greatest load of $\frac{1}{64}$ in., demonstrating the bolster to be able to stand any amount of overloading without likelihood of the wheel flanges being cut from the side bearings carrying the car instead of the centre plate. Also eliminating the danger of brasses and journals being heated or cut by pulling in the frame at the top. The bolster, being in no way permanently fixed to any other part of the truck, has been designed of such form and dimension as will permit usage that would destroy an ordinary car without injury to itself. The intention is that as the bolster is the only part of the truck which could not be made in any ordinary smithy or bought from an iron monger, to provide one that will outlive in an accident all the other parts of either car or truck.

Fig. 11.—Bogie Truck for Nitrate Railways Co., Chili.

The sand planks are of an extra heavy channel (10 in. x 3½ in. x⅝in.). The weakest point connected with the use of light channel sections for sand planks is the danger of

tearing off the flanges by the columns in case of derailment. In the truck shown, this danger has been overcome to some extent by not making any rigid fastenings between the arch bars and the sand plank, nor between columns and sand plank. As will be seen, the sand plank is free to slide upon the columns if the spring be removed, and as it is aimed to make the truck frame stronger than the spring, it is at least probable the breaking of the latter will be in advance of damage to the sand plank, or at least such damage as will be beyond the ability of an ordinary repair station to make good.

After the bolster and sand plank, every other part of the truck frame can be made at the nearest shop or drawn from stores. There are no patterns, no special shapes, all ordinary bars and a few pieces of gas pipe.

In the truck the columns are made to help each other to resist shocks and to keep the frame square. The column guides on both sand plank and bolster completely encircle the column, so that two of them, on opposite sides, might be displaced without endangering the truck.

It will be interesting to note there are few of the fastenings in this frame exposed to direct shearing strains; nearly every bolt has tension alone to resist.

The extension of the top arch bar forms a convenient means of swinging outside brakes; but, aside from their use for this purpose, the peculiar way in which the lateral fastening is made, provides an infallible means of securing a square truck at the start and keeping it so; a result that cannot be obtained by ordinary riveting or bolting. The case of adjustment both vertically and horizontally will be seen at a glance.

The system of brake beam hangers with large bearings on the transverse tubes instead of dependence upon a small bolt, and the simple brake with its lever equalized within itself, the use of an idle lever obviated, are shown by the drawings and do not require explanation beyond stating that the brake shoes shown by them were the Railway's standards; the Cristie head and shoe would be readily adaptable. For such as prefer the inside hung brakes, means are easily provided for swinging them from the arch bar, using additional transverse tubes for the purpose, leaving the outer tubes in place as well.

For brakes applied to both sides of the wheel (which is by far the better way), it is claimed the system has no equal.

As a novelty, attention is called to Fig. 12, which illustrates an equalizing "diamond frame" now being built for passenger cars of an extensive railway. In this truck the standard freight car axle box is bolted into place in the ordinary diamond frame, and the springs so arranged about the cylindrical columns that it is possible to dispense with the

4 Pedestals,
2 Equalization bars,
4 Spring seats (equalizer springs),
4 Swing beam axle bearings (top),
2 " " axles "

to say nothing of the bolts and nuts for fastening them; substituting in their places eight spring seats, four of which slide on the tube columns; a turned column, and a bored hole in the seat making a mechanically perfect fit. The frame, with its transverse tube ferrules and tie rods, has all of its strains in lines of its greatest strength, and the whole forms a striking commentary on the uselessness of torturing plates into goose necks to provide means to keep a truck frame bobbing up and down in horn plates, wearing itself out in misspent energy.

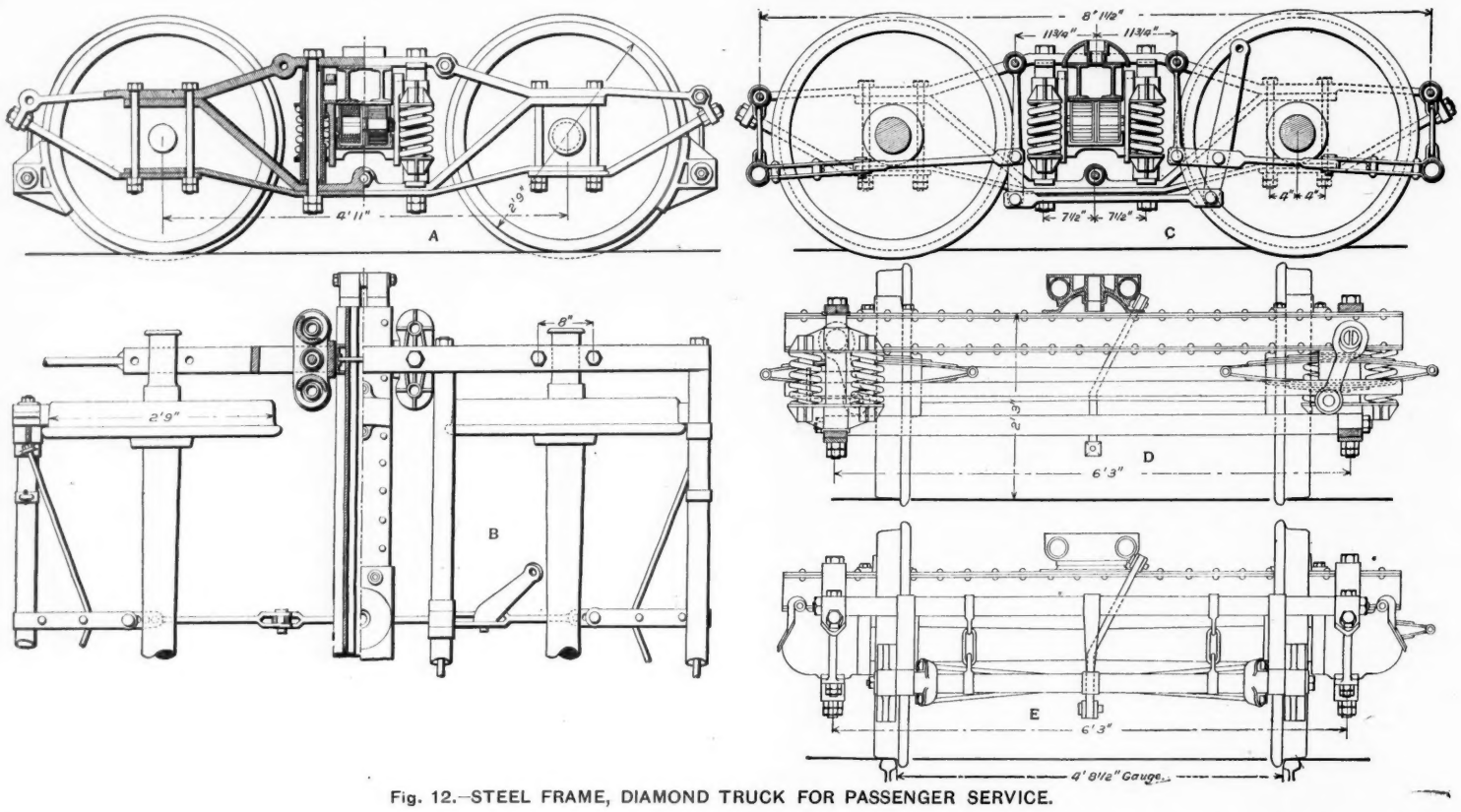


Fig. 12.—STEEL FRAME, DIAMOND TRUCK FOR PASSENGER SERVICE.

Economy of Locomotives Compared With Stationary and Marine Engines.

The first part of an interesting article by M. Desdouits Ingénieur en chef adjoint du matériel et de la traction of the State railroads of France, on the comparative economy of locomotives has recently been published in the *Revue Générale des Chemins de Fer*. After a historic review of the development of stationary and marine engines from the days of Newcommen and Watt to the latest improvements in non-compound stationary and marine engines, the author takes up the simple locomotive as now used on the various French lines and gives a very complete analysis of its performance and economy. It is interesting to note in passing that Newcommen's engine consumed 17.5 to 22 lbs. of coal per H. P. hour. Watt, in his double-acting engine with separate condenser, reduced the consumption to 6.6 lbs. of coal per H. P. hour. This was farther reduced to about 4.4 lbs of coal, evaporating 35 to 40 lbs. of water per H. P. hour, which is about the best that was done until shortly before the introduction of the modern high speed automatic cut-off engine. At this time the consumption of the best plain slide valve engine was about 27.5 pounds of water per H. P. hour.

Marine engines have shown similar improvement. The earliest types consumed 6 to 7 lbs. of coal per H. P. hour, which was reduced by gradual improvement and by substituting the screw propeller for paddle wheels, to 4.4 lbs. of coal per H. P. per hour, or about the same economy as shown by the best stationary engines of the same type.

The early and almost universal use of compound engines in marine work, obviated the necessity of the further development of the simple engine.

The performance of the earlier types of French locomotives, as given in the results of tests made on some of the older styles of engines still in use on the Eastern railroad of France during the year 1867, show a consumption of 36.38 lbs. of water per H. P. hour for express engines, and 33.07 lbs. for freight engines. In these tests the proportion of entrained water is given as 30 per cent. of the total, which, although seemingly very high, may not be for the small and poorly designed boilers then used. Assuming this to be correct, these engines show an average consumption of about 26.5 lbs. of dry steam per H. P. hour. These tests indicate that the early types of locomotive, contrary to general understanding, compare very well in economy with the best types of stationary and marine engines using similar valve gear and in use at the same time.

On the Lyons Railroad in France, in 1882, tests of a locomotive on heavy grades showed a performance of 27.44 lbs. of water per H. P. hour, with 9 per cent. entrained water, or about 25.5 pounds of dry steam per H. P. hour. The average point of cut-off was estimated at 30 per cent. of the stroke.

During the year 1893 an elaborate series of locomotive engine tests have been made on the French State Railroads, of which the following is an extract.

The engines used have four drivers coupled and the following principal dimensions:

Diameter of driving wheels	78.7	inches
Cylinders:—		
Diameter	17.27	"
Stroke	25.6	"
Volume	6041.5	cu. in.
Volume of clearance at each end	305.1	"
Area of each steam port	18.16	sq. in.
Port Opening:—		
In full gear, viz. .7 of stroke	1.2	inches
At 25 per cent. cut off	.36	"
Outside lap of valve	1.18	"
Inside " " "	.098	"
Steam pressure	128 to 142	lbs. per sq. in.

The first tests were made with five engines, all in good condition, running in express service between Versailles and Chartres, a distance of 43.7 miles, as follows:

Number of engine	2043	2045	2046	2056	2057
Date of test	April 3	Mar. 25	Mar. 18	June 6	Mar. 14
Force and direction of wind	Calm	Calm	E.—Light	Calm	E.—V. light
Weight of train in tons	199	186	188	186	187
Average point of cut-off, per cent.	23	24	24	28	25
Average speed (miles) per hour	38.4	39.7	37.2	40.3	37.2
Total work done H. P. hours	333	330.8	361	338.7	351
Water used by cylinders, lbs	8598	8461	9369	8549	8928
Water used per H. P. hour	25.79	25.57	25.79	25.35	25.57

The water used by the cylinders was obtained by deducting the amount wasted at injector and elsewhere, and also the amount used by the air pump, previously found to be 3 per cent. of total. The remarkable similarity of the performance of these five engines is very striking and indicates that locomotives of the same design will give the same results if in the same condition and handled the same way.

In order to observe the effect of proper and improper work of the engineer, two runs were made with this class of express engine. The first engine, No. 2,045, in charge of an engineer who preferred to run with but a partly open throttle and who was allowed to use his own pleasure in handling the engine. The second run, Engine 2,075, was made with a uniform cut-off of 25 per cent. and full throttle except on down grades and occasionally on the level when speed became too high. The following table gives the data and results of this test:

Number of engine	2045	2075
Date of test	Apl. 20	May 17
Force and direction of wind	Calm	Calm
Weight of train, tons	135	124
Average point of cut-off	Variable	25
Average speed (miles) per hour	34.1	34.7
Work done H. P. hours	213	205
Water used, less that wasted and used by air pump, lbs	6194	5203
Water used per H. P. hour	29.1	24.37

This test, while including but two individual runs, has been made a number of times with average results, justifying the conclusion that it is not exceptional.

In locomotives for high speed the amount of clearance in the cylinders, together with the inside lap of the valve, exert an important influence upon their economical performance on account of the excessive compression which is often obtained with the valve adjusted to an economical point of cut-off. In order to observe the effect of reducing the inside lap of valve a round trip in express service was made between Chateau du Loir and Courta-

lain, a distance of 47 miles, with the inside lap reduced from .098 in. to .011 in. as follows:

Number of train	86	87
Date of test	Feb. 18, '93	Mar. 29, '93
Force and direction of wind	Calm	Calm
Weight of train, tons	179	221
Average point of cut-off	not given	not given
Average speed (miles) per hour	37.2	37.2
Work done H. P. hours	394	347
Water used, less that wasted and used by air pump	9259	8461
Water per H. P. hour	23.48	24.45

Average water per H. P. hour for entire run. . . 23.96

The results of this test are continuing in the regular work of this engine. Since the change in the inside lap has been made it has constantly held first place on the performance sheet. The figures given above show the entire amount of water passing through the locomotive cylinders. While the amount of moisture in the steam has not been determined, it probably does not differ much from 5 per cent., the lowest found in our marine practice. It is, therefore, fair to conclude that locomotives with plain slide valves can be operated with a consumption of below 24.25 lbs. of water per H. P. hour. Engines with cylindrical valves have shown an economy of 5 per cent. over those with unbalanced side valves, due to their being balanced and on account of the reduction of clearance made possible by their use. Under average working conditions passenger engines now use from 25.36 to 26.46 lbs. of water, or 24.25 to 25.36 lbs. of dry steam per H. P. per hour. These results are notably better than those obtained formerly, either with stationary or marine engines. The principal reasons for this improvement are:

1st. Higher steam pressure.

2d. A speed of rotation high enough to prevent serious condensation on the cylinder walls and yet low enough to enable steam to be exhausted without difficulty.

3d. The use of the link, an appliance not only very convenient for handling the engine, but also admirably adapted to regulate the point of cut-off for all grades of expansion greater than 20 to 25 per cent.

The conditions for greatest working economy are:

1st. A steam pressure of about 142 lbs. per sq. in.

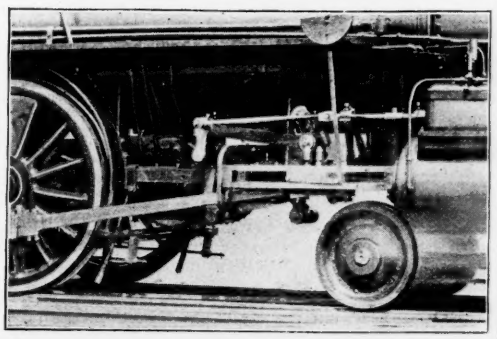
2d. Cylinders of such size as will permit running with a sufficiently short cut-off, but not less than 20 per cent.

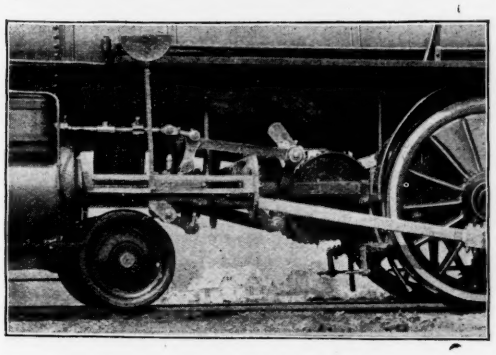
3d. Proper proportion of clearance in cylinder ends (6 to 8 per cent. at each end).

4th. Free exhaust obtained by giving the valve inside clearance instead of inside lap.

Lamplough's Valve Gear.

The valve gear which is illustrated herewith is the result of six or seven years of study and experiment by Mr. Lamplough, but it is only within a few months that he has brought it to that degree of perfection that he has been ready to put it on an engine. A few months ago the gear was put on engine No. 39 of the New York, Ontario & Western Railroad, and the engravings showing the parts in place are from photographs of that engine. It is an 8-wheel passenger engine, built by the Baldwin Locomotive Works in 1872. The drivers are 62 in. outside diameter, cylinders 17 in. x 24 in., diameter of boiler 50 in., weight on drivers 26 tons, total 40 tons. The engine is running regularly in passenger and freight service, and is doing good work.





Lamplough's Valve Gear on N. Y. O. & W. Engine, No. 39.

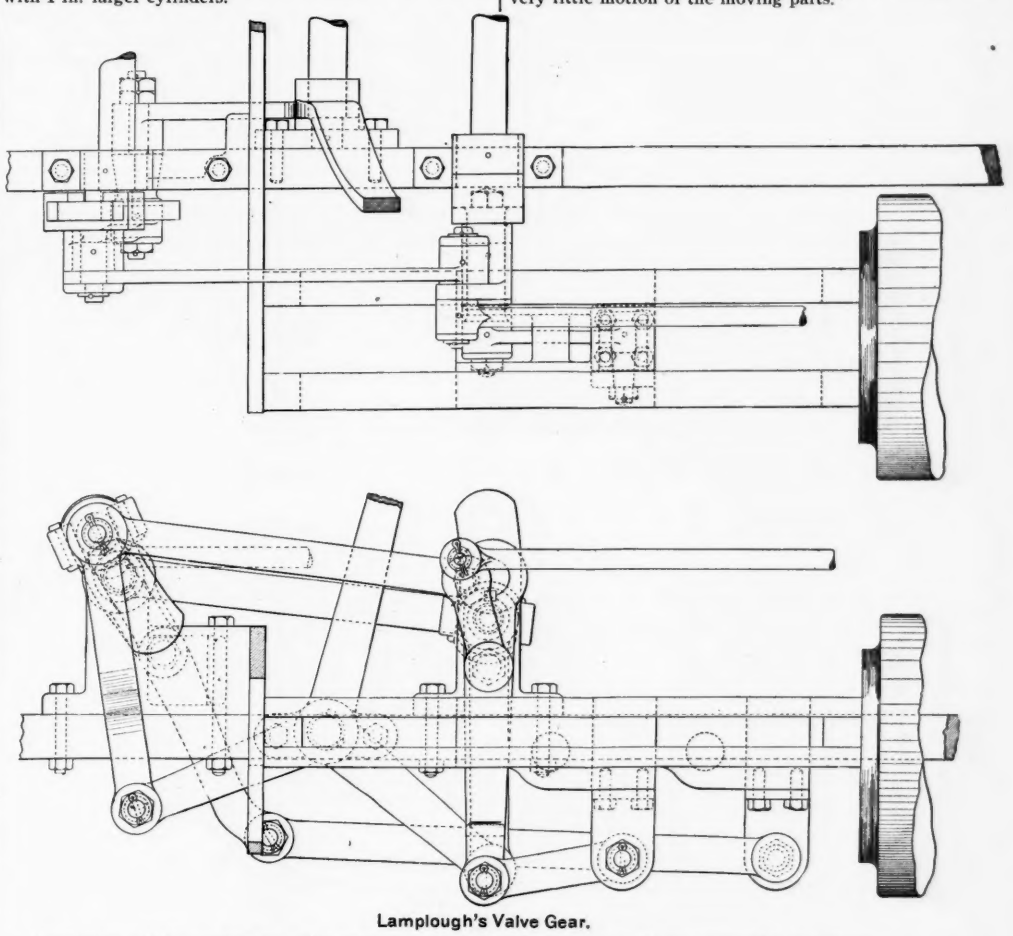
The officers of the road consider the Lamplough a stronger link motion than the one which it replaces. No very high speed has been secured, which, it is suggested, is due to lack of sufficient lead; but the engine makes schedule time, and does it with some saving of fuel, is easily handled, and, so far as we can learn, is satisfactory both to the runners and to the Superintendent of Motive Power.

Since this valve gear was put on engine 39, the exhaust nozzles have been increased from 2½ in. to 3 in., and she now steams easier and is doing the work of an engine with 1 in. larger cylinders.

Extreme regularity in running, and easier handling on account of the perfect balance of reversing motion.

Increased pulling capacity of engine, 10 per cent.

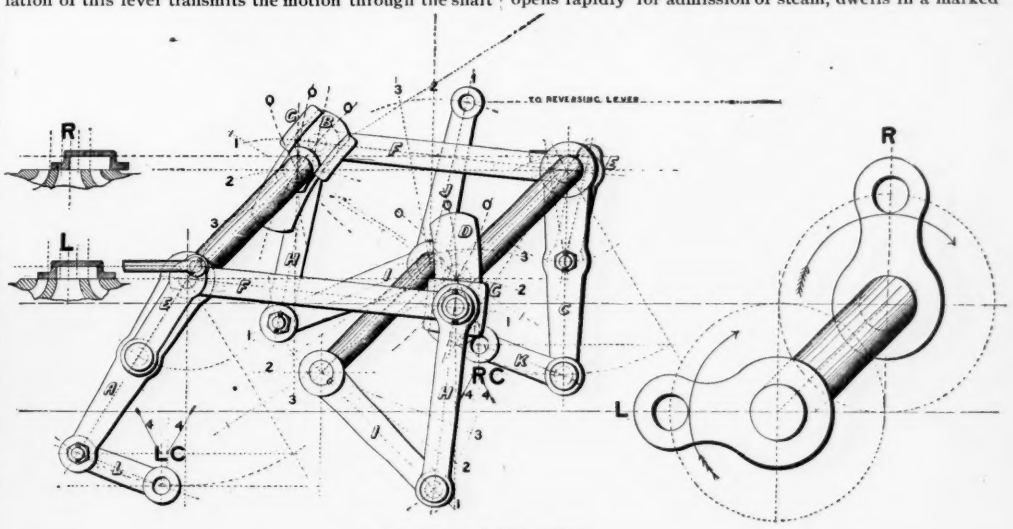
Lessens the chances of the gear running hot, on account of very little motion of the moving parts.



Lamplough's Valve Gear.

A description of the mechanism, with reference to the engravings, follows.

The lever A is attached by the lower end by means of short link L to the crosshead of the left engine, the oscillation of this lever transmits the motion through the shaft to quadrant B. Lever C is attached to crosshead of right engine in a similar manner and communicates motion through shaft to quadrant D. Two small levers EE, are fulcrumed at their lower ends to the levers A and C, as shown. The upper part of these levers are connected by radius rods EF, to blocks GG, sliding on quadrants B, D. When the reversing lever is placed on point 2, the reversing arms II, by means of vibrating levers HH, will keep the blocks in mid-position on centre of the quadrant; in this position the levers AE, and CE, move as one piece, simply communicating lap and lead to the valves, and according as the distance blocks GG, are radiated from the centre of the quadrants, so is the amount of port opening determined, and, of course, cut off in proportion to port opening, enabling any degree of cut off from 1" to full stroke, the latter being a great desideratum when starting against a heavy load.



Lamplough's Valve Gear.

The inventor makes for this gear the following claims:

Saving of initial cost of construction, being a fewer number of parts and much simpler.

Compactness, saving of space, and allowing an extension of the fire box 8", thereby giving extra grate area, enabling a cheaper fuel to be used.

Perfect arrangement of mechanism, allowing of light construction, dispensing with balance weights, and giving great rigidity with considerable less weight.

Saving of fuel, as this gear can be cut up without altering the lead, thereby allowing the steam to be used expansively, and ensuring perfect distribution.

Saving in cost of maintenance, and in oil.

Reduced chances of break-down, as the gear is under the eye of the engineer while in motion, and is so placed as to permit of inspection at all times.

Doing away with the eccentrics and straps.

Will allow the main rod to be attached to third pair of drivers on consolidation engines now fitted with short rods attached to second pair.

The lead is constant under all circumstances. The valve opens rapidly for admission of steam, dwells in a marked manner when full open, and closes very rapidly at cut-off. The opening and closing of exhaust are likewise rapid.

Montreal Meeting of the Mechanical Engineers.

The Montreal meeting of the American Society of Mechanical Engineers was opened at Molson Hall, McGill University, by Mr. Herbert Wallis, Chairman of the Local Committee, at about 9 o'clock, p. m., June 5. The members and guests were delayed by a very heavy rain, which kept many of the ladies from venturing out, although the hall was well filled.

On the platform with President Coxe sat the Chairman of the Local Committee, the Mayor of Montreal, Sir Donald A. Smith, Chancellor of the University; Professor Bovey, Mr. Kennedy, Secretary of the Canadian Society of Civil Engineers, and Mr. Hunt, of the Society of Stationary Engineers. Mr. Peterson, President of the Canadian Society of Civil Engineers, was on his way to Vancouver, where he had been called by the terrible floods in the Frazer river valley.

In the address of welcome, Mr. Wallis dwelt upon the mutual interest of all engineers, regardless of nationality, and this was still more strongly emphasized in a letter from Mr. Peterson, written aboard a train for Vancouver, in which he took Senator Frye to task for his recent unfortunate remarks relative to the animosity existing between the Dominion and the United States.

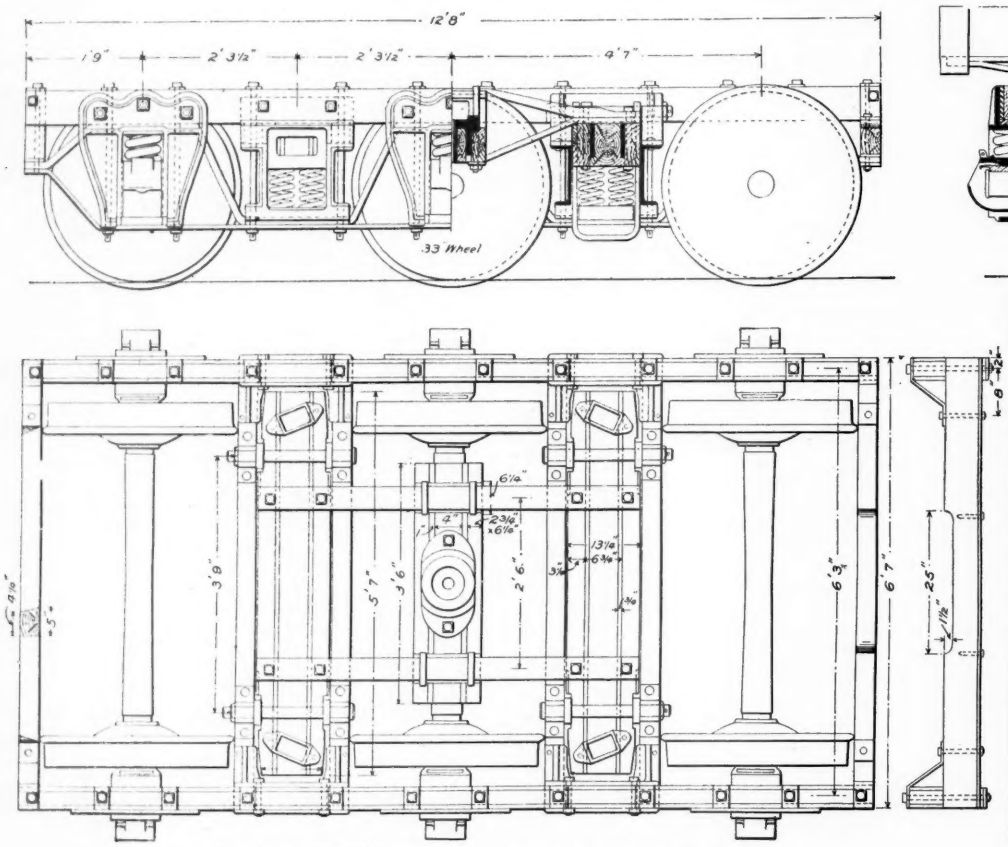
Mr. Wallis then introduced the Mayor of Montreal, who

read his address of welcome from an illuminated parchment. Dean Bovey, of the faculty of Mechanic Arts and Engineering, next welcomed the members in a cordial and humorous vein, and put his most complete and beautiful laboratories at the disposition of the visiting engineers. He also pointed out that however practical men might be, he believed that all future development was primarily dependent upon mathematical training, and without this, thoroughly practical courses of instruction would be incomplete.

Mr. John Kennedy, Chief Engineer of Harbor Works, then welcomed the visitors on behalf of the Canadian Society of Civil Engineers, and was followed by the Committee of the Stationary Engineers, who presented an illuminated address of welcome.

Chancellor Sir Donald Smith extended the courtesies and hospitality of the University.

President Coxe responded to the speeches and finished with his Annual Address, the subject of which was "Technical Education," which he discussed at considerable length. The main point of his argument was based on the fact that as there is a difference in men's qualifications, so there should be differences in their education; and that as there were many most renowned engineers who were not mathematicians, because their strength lay in other directions, time should not be wasted to develop



Truck for 100,000 lbs. Flat Car.—Chicago & Northwestern Railway.

their weak side, but all encouragement should be given to their aptitudes. He did not think that one who could not master the calculus should be sifted out from his fellow students, but he should be allowed to proceed because he is more capable in other directions.

After the conclusion of this address the members visited the various rooms in the MacDonald laboratories, where they stayed late. The Society's Register at Headquarters showed an attendance of over 300.

We take up the papers and discussions about in the order of their presentation, not attempting to observe strictly the different sessions.

Mr. Albert K. Mansfield presented a paper entitled "Notes on the Theory of Shaft Governors." This is a mathematical analysis with many diagrams, without which an abstract could not be made intelligible. Mr. Mansfield considers the path of an unbalanced governor ball, the centrifugal movement of governor weight, the position and tension of the spring and the influence of the weight of the spring and of the weight of the link, the frictional effect of the valve and the inertia in the governor. An abstract of the discussion follows.

Professor Lanza started the discussion by asking two questions: How does the friction vary in a shaft governor during the period of regulation? and whether the author had determined the effect of the weight on the scale of the spring experimentally? The author could not answer the first question, and although he had not made experiments to answer the second, he thought that the effects of centrifugal force are practically constant.

Professor Jacobus called attention to the fact that the paper did not state the time necessary for the governor to adjust itself to changed conditions. He filled in the omission by reporting results of his investigations, which showed that the shaft governor on a Ball engine required about the same length of time to adjust itself from no load to half load, or from no load to full load, or variations of load, and that this rate of change was the same whether the governor had been adjusted for sensitiveness or not. Most shaft governors probably acted in a similar manner. He furthermore pointed out that the inertia weight could be applied in such a manner as to affect rapid action of governor, and that this depends upon the manner in which the fly wheel is connected or attached; he pointed out that the fly wheel might move back 40 per cent. during the adjustment of governor, and hence it would affect its action in such case.

Mr. Frank Ball thought that the splitting up of the governor weights into inertia and a centrifugal weight was unnecessary, as such a position could be given to a proper weight as to replace the two. This proposition was strongly combatted by Mr. Rites and the author.

Professor J. B. Webb also pointed out that the action of the springs was such that their scale or rate did not change during adjustment.

Mr. C. W. Baker asked what would be called a "reasonable" variation of speed; but while he intended his inquiry to apply to the period of adjustment, he answered that all shaft governors would regulate within the usual specifications of 2 per cent. variation. The previous discussions, however, indicated that the variation during adjustment might be much greater, depending upon the design of the governor. Mr. Albert F. Hall presented a paper on "Heat Units and Specifications for Pumping Engines." This paper was not discussed, but Mr. A. A. Cary pointed out that a beginning had been made in writing specifications for power plants in which the capacity was based on the head units developed.

Professor W. H. Bristol presented a paper on "A New Recording Pressure Gage for Extremely High Ranges." This gage, although it may be adapted to ordinary ranges, was designed originally for high ranges and to supplement the sinuous tube and diaphragm forms. The principal object was to produce a gage which would stand pressures of 1,000 lbs. or more, and one in which the readings for increasing and decreasing pressures would be the same. In the gage described the spring part consists of a Bourdon tube of flattened cross section wound in four complete revolutions; one end is fastened to a bracket with an opening for the pipe, communicating to the gage, the other end carries the pen arm. The diameter of the coil is only one inch and this being distributed through four complete turns of the tube in the angular movement necessary to carry the pen arm the tube is not strained to approach its elastic limit and multiplying devices are avoided. By varying the thickness of metal, the cross section and the winding of the tube, a helix adapted to any desired range may be obtained, even as low as 5 lbs. per sq. in. This gage is the joint invention of Mr. E. H. Bristol and Professor W. H. Bristol. This paper elicited a spirited and prolonged discussion, which was renewed on the following day.

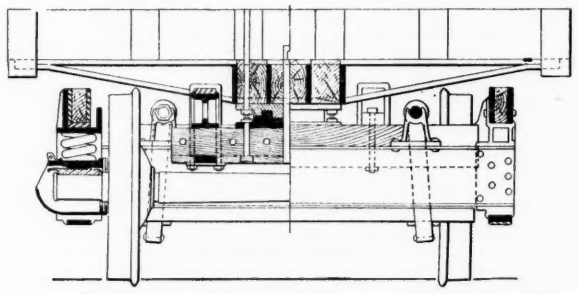
Mr. G. C. Henning asked for information whether the form of tube in this gage retains shape and rate permanently.

Messrs. Holloway, La Farge, Cary, Almond, E. H. Babbitt, Professor Webb and others all related their experience with gages and springs, but some of the criticism arose from a misapprehension of the instrument. It was pointed out that in order to obtain a tube of the required strength and thickness without the usual initial and residuary strains found in all ordinary tubes, Professor Bristol made them by electro deposition. How this was done could not be explained as the author was absent.

Mr. La Farge gave his opinion that the particular form of tube used would in course of time change its shape and rate. Mr. Cary gave his experience that all springs made of composite metals would gradually change their elasticity and shape just as a glass barometer or thermometer tube does, and that constant use would gradually remove initial strains or permit a re-arrangement of the molecules. He pointed out that his experience was to the effect that nothing was so perfect as a properly made steel spring.

Mr. Almond pointed out that steel wire could be made to change its temper by being passed through a bath of hot water, immediately before coiling into a spring, so that a hardened rod, which under ordinary conditions would break off short, would coil readily under his method. He also confirmed Mr. Cary's statement that time had considerable influence on the ductility of wire, and while easily workable after several months' rest, would be useless when used within a few days after leaving the draw plate. It was also pointed out that, so far as known, the Bristol gages remained permanent, because the tubes in them were strained between very narrow limits, and because all connecting or magnifying mechanism was wanting.

Mr. La Farge gave the instance of a Bourdon gage having been fastened directly to the cast iron front of a boiler, and after six months or more the constant action of the heat on the gage had ruined it so as to make it useless.



Mr. Frank Richards presented a "Note on Compressed Air," in which he attempted to correct the notion that the use of compressed air for transmitting power "entails enormous losses," concluding that the air-compressing cylinders of the principal builders of compressors do not vary more than 10 per cent. in the economy of their compression, while in any large town one may find an engine and boiler using over 400 per cent. of the coal per horse power per hour used in the best engines.

Professor Jacobus pointed out that water was always admitted into the hot air causing vaporization, which afterward did a considerable amount of the work formerly ascribed entirely to the air. He was investigating this matter under conditions obtaining in most of the air engines in common use, and would report results to the Society. As far as he had gone, his results showed that the effect of the entrained watery vapor was similar in all the hot and compressed air engines, and was very perceptible.

The next paper presented was by Mr. A. W. Robinson, on "The Relation of the Drawing Office to the Shop." He describes the system employed by his company. He assumes that the office employs from 10 to 15 draftsmen and that in the drawing office is the sole authority to issue orders to the shop for new work or work in which there are changes and variations from previous similar work. The procedure is, the order being entered on the books of the company, the businsess office issues a written order to the drawing office and the shop on a blank stating the name of the machine, the time of delivery, and the number of specifications to be worked to, and the number by which the order is to be known. If the work is new, or in any sense special, the shop superintendent cannot proceed until orders come down from the drawing office, and these orders are issued on proper blanks giving the order number, the date, the name of draughtsman, the signature of the proper officer and examiner. These are made out in triplicate, two copies being sent to the shop superintendent, who files one and sends the other to the foreman. The drawing office also orders the raw material for new and special work on a proper blank. Written orders are not issued from the drawing office to other departments, except pattern shop and foundry. Drawings and sketch sheets issued to other departments pass through the hands of the shop superintendent and in themselves constitute orders.

Certain drawing office rules are formulated, fixing the uniform size of 23 in. x 36 in., half standard sheets 18 x 23, and sketch sheets 8 x 11. Dimensions are so clearly stated by figures on the drawing that no measurement need be taken in the shop by scale, and all figured dimensions below three feet to be expressed in inches. Each draughtsman is supplied with a sketch book in which he makes all his notes, calculations and data, and under no circumstances is he to do the original work on loose sheets and then transcribe it. These books are the property of the company. The sketch sheets referred to are 8 x 11 in., on stiff cardboard, the heading printed in copying ink and the sketch made with a copying pencil, and they are press-copied in books kept for the purpose. The use of these is for work which does not require to be often duplicated and for quick dispatch. A free-hand sketch can be made, copied and issued in 10 minutes, while the

regular process of drawing, tracing, blue printing and waiting for the latter to dry may consume hours. They have other advantages in convenience of handling and in saving multiplication of tracings. These sheets, if for permanent use, are sized and varnished.

Original drawings are not finished, but are traced, and the drawings are used to print from and filed away in a fire-proof vault. The writer does not advocate the employment of cheap draftsmen to trace shop drawings from the originals of the designer, for if this is done the designer must finish his original to completeness. A draftsman worth $120 a month will usually trace twice as fast as one worth $60, and do it better.

Mr. L. S. Randolph pointed out the desirability of having the pattern room in close proximity to the drafting office and so arranged that the draftsman could have ready access in order to avoid duplication of patterns, and to alter old ones for new purposes wherever that was possible. He doubted the advisability of having orders for materials issued by the drafting office, as this should be done by the clerks after a careful comparison with the stock inventory.

Mr. Wright thought the sizes of drawings given not good; they would be variable for different work.

Mr. A. J. Shaw pointed out that it is wrong to indicate all measurements under 3 feet in inches, as the foot rules are never over 24 inches long, and it is unwise to depend upon additions and subtraction by mechanics, and therefore dimensions on drawings should be in inches up to 24, and in feet and inches above that length.

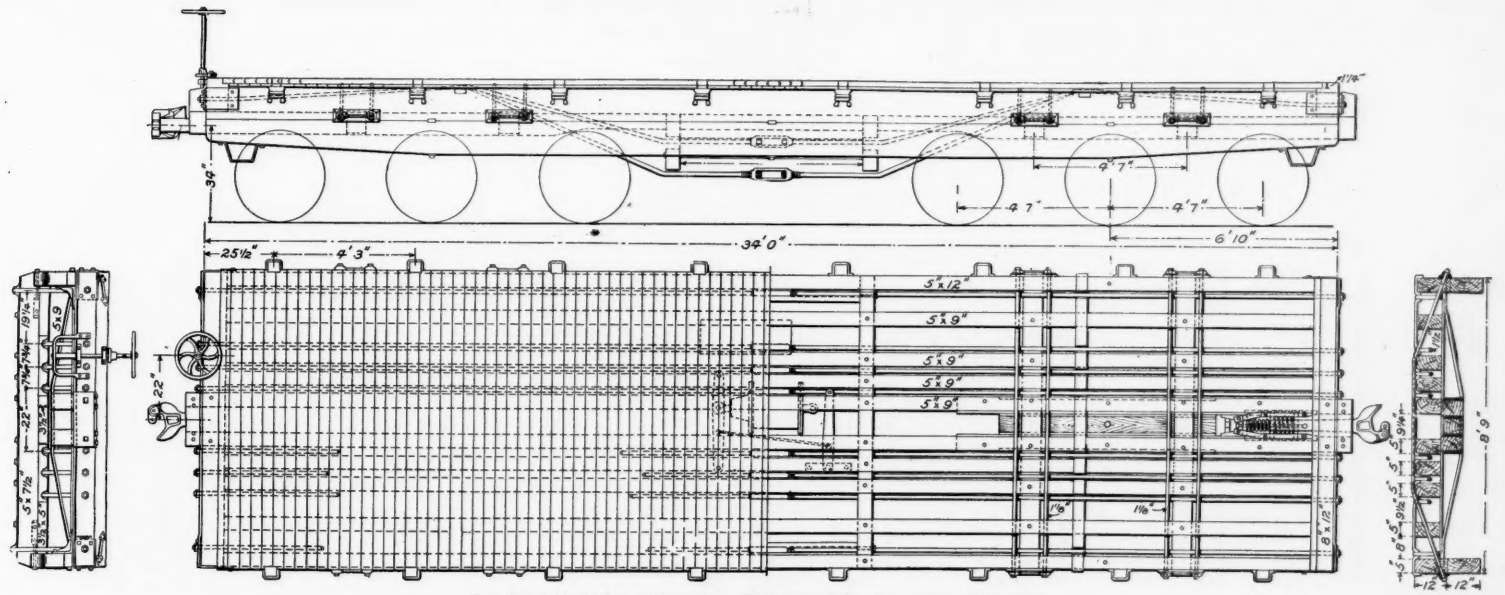
The report of this meeting will be concluded in our next issue.

Flat Car of 100,000 Pounds Capacity.

The management of the Chicago & North Western Railway, finding a demand for a car of sufficient strength to carry loads of more than ordinary weight, built, over a year ago, a special heavy car of 100,000 pounds capacity. Another car of the same type has just been completed, the construction of which is shown in the accompanying illustrations, for which we are indebted to Mr. C. A. Schroyer, Superintendent of the Car Department.

The car is 34 ft. long over sills, and 8 ft. 9 in. wide over side sills. The framing is very heavy, there being eight center and intermediate sills, 5 in. x 9 in. in section, while the side sills are 24 in. in depth, and consist of two 5 in. x 12 in. timbers placed one above the other and securely fastened together. Eight 1½ in. longitudinal truss rods serve to stiffen these timbers, the six inner ones supporting the center and intermediate sills, and the two outer ones the side sills, as shown in Figs. 1 and 3. The truss rods are carried over the trucks upon a 4 by 1 in. wrought iron bar laid across the car upon the sills and bent down at the proper points to receive the rods.

Each body bolster consists of two common wrought iron bolsters trussed in the usual manner, spaced 4 ft. 7 in. apart, and connected by a composite longitudinal member which continues to the end of the car and forms a part of the draft gear. The body center plate is placed on this member midway between the two iron bolsters. The truck used with this car is of the six-wheel swing motion type without equalizers and simply and substantially constructed. The truck frame is of wood and heavily plated with iron. The pedestals are of the four used in passenger service. Spiral springs are used both above the boxes and under the truck bolsters, which are of the composite type. A bridge of the form ordinarily used on six wheel trucks connects the two truck bolsters and furnishes a bearing for the truck centre plate.



Flat Car 100,000 lbs. Capacity.—Chicago & Northwestern Railway.

A Drawbar for Elevated Railroad Service.

Our illustration shows a drawbar designed by Mr. D. L. Barnes, for use on elevated railroads, and applied about 18 months ago to the equipment of the Chicago & South Side Rapid Transit Company. The drawbar originally used on this road gave considerable trouble by breakages, not being adapted to use on heavy trains with the high average speed over the line demanded by the schedule of the road.

On account of the movement past one another of the ends of adjacent cars on the curves common to elevated roads, it is necessary to provide long drawbars, as in street car service, and allow them considerable lateral motion. The drawbar shown is consequently long, and transmits all buffing or pulling strains directly to the body bolster of the car, instead of being attached to draft timbers or centre sills.

The body of the bar consists of a short length of 70-pound rail, 4½ inches in depth, and with a flange of the same width. To this are fitted at each end the necessary attachments. The rail curves slightly upward from a point a short distance back of the head in order to make a sufficient offset to bring the back end of the rail to the required height. To this end of the rail are bolted two iron bars 1½ by 2½ inches in section, swayed to fit against the head and flange of the rail, and slightly clear the web. These bars extend through the bolster, and to some distance beyond, and at the ends are drawn out and threaded for a 1¼ inch nut.

To each side of the body bolster is bolted a cast-iron plate, through which passes the tail bars of the coupler. The plates have a convex surface, and form a bearing for the seats of the springs, one of which is placed on either side of the bolster. It will be noticed that the tail bars are spread apart for a sufficient distance to clear the centre pin, and permit a free movement in either direction without bearing upon the pin. The bar can be moved laterally in either direction with no other resistance than that due to the friction of the spring seats upon the bearing plates, and the tension of the springs so adjusted as to get the desired amount of spring slack in the train. The opposite end of the drawbar is supported at the proper height upon an angle iron bar of sufficient length to give the bar the requisite amount of lateral motion.

The head of the bar is of cast steel made in two parts, finished and joined on the centre line of the bar end, and strongly bolted and riveted together. It is secured to the section of rail by bolts as at the rear end. The face of the bar is finished flat, its surface being perpendicular to the centre line of the bar, and the link used is of such length that when the pins are down, the faces of the two drawbars coupled together will be brought into contact.

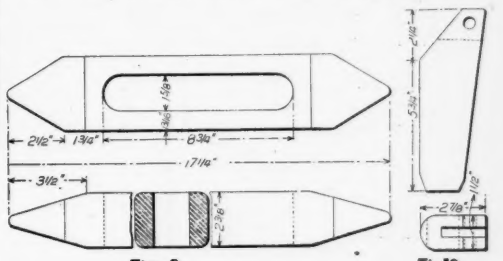


Fig. 2 Fig. 3.

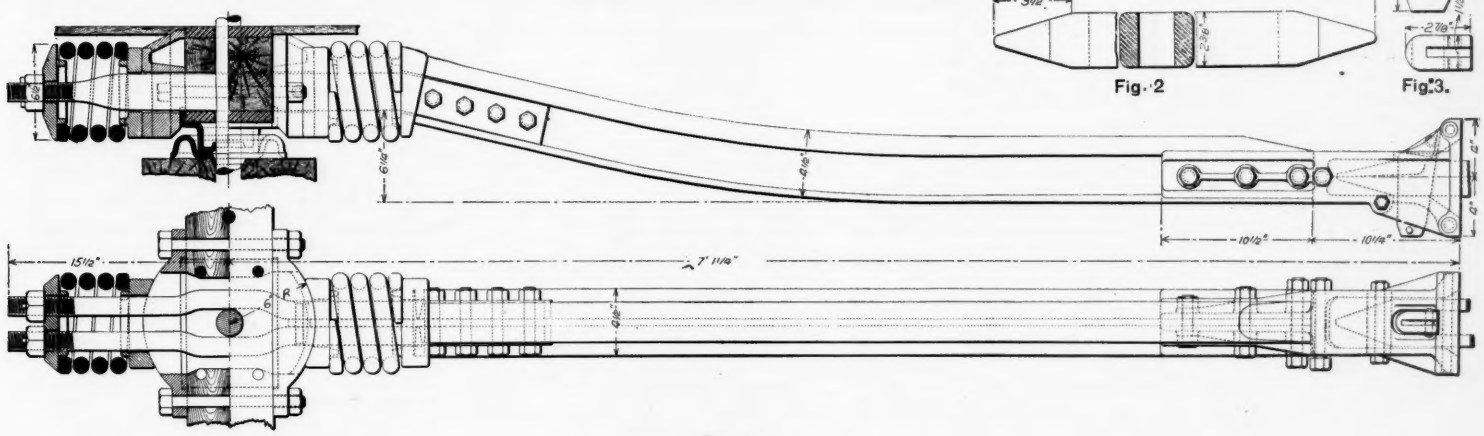


Fig. 1.
Coupler for Elevated Railroad Service.

The seat against which the pin draws is accurately slotted to such an angle with the face that it is not liable to work out, and in order to guard more effectually against this possibility, a simple device not shown is attached to the lower end of the pin in such a manner that the pin can be removed or replaced very quickly. The pin is of cast steel, and finished accurately to size. The links are also of cast steel 2⅜ by 3½ inches in section with tapered ends, and finished inside to the required dimensions.

It will be seen that the free slack in a train fitted with these bars will be very small, and it is well known that this slack is the principal cause of the violent shocks often experienced on elevated railroads. It was partly to avoid free slack that the bar was not made automatic, and partly because of the fact that even though they did couple automatically, it would still be necessary to place both bars on the centre, and guide them carefully. One of the leading coupler firms of the country, after a careful study of the matter, advised against the attempt to make an automatic coupling.

The bar to be used on the West Side Metropolitan Elevated Railroad, of Chicago, will have the back end arrangement designed by Mr. Barnes, and the Van Dorn head, a form of coupling well-known in street car service. Except for the occasionial breakage of a spring in switching, the bars ilustrated have given no trouble whatever, and these can be easily replaced.

Intercepting Valve for the Richmond Compound Locomotive.

An illustration and description of the two-cylinder compound locomotive built by the Richmond Locomotive and Machine Works, for the Cleveland, Cincinnati, Chicago & St. Louis Railway appeared in the *Railroad Gazette*, March 9, 1894. It was said in the description, however, that permission had not been obtained to illustrate the intercepting valve. This permission has now been granted and

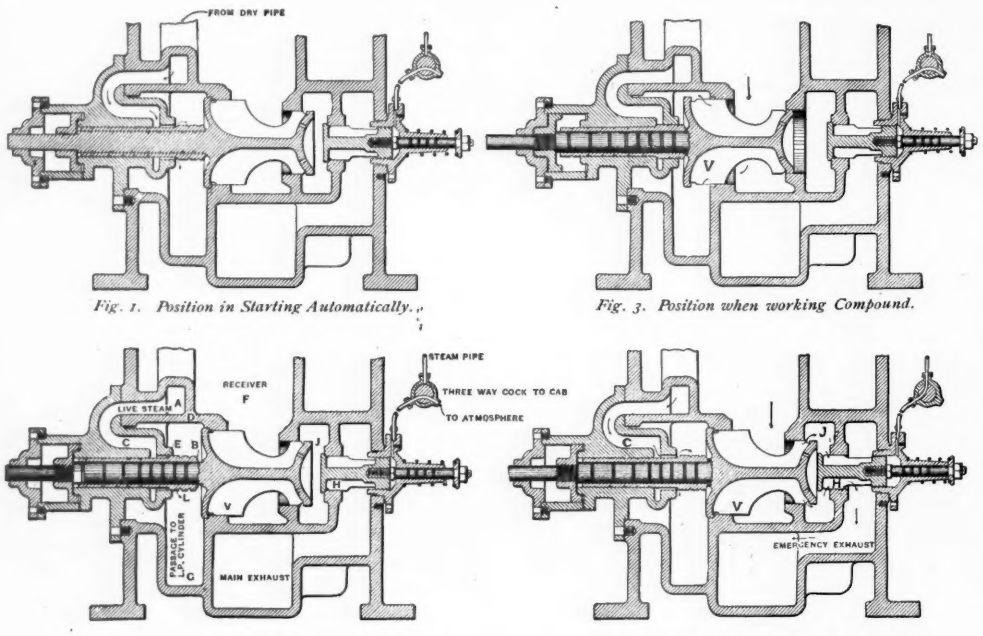


Fig. 1. Position in Starting Automatically.

Fig. 3. Position when working Compound.

Fig. 2. Position in starting at maximum pressure in LP. Steam Chest.

Fig. 4. Position when working as simple engine.

Intercepting Valve for Richmond Compound Locomotives.

with this are shown four views of the valve. The drawings show sections taken through the low pressure cylinder saddle, with the valves in their various positions.

Fig. 1 shows the valves in their positions when working automatically to allow steam direct from the boiler, hough at reduced pressure, to enter the low pressure steam chest during the first one or two revolutions at starting. Fig. 2 shows the position of the valves when there is a maximum pressure in the low pressure steam chest; in this position communication with the low pressure steam chest is cut off from both the receiver and the line steam pipe. In Fig. 3 the valve V has moved to the left from the position shown in Fig. 2, and has opened communication between the receiver and the low pressure steam chest. When the valve is in this position the engine is working compound. Fig. 4 shows the position of the valves when, by means of the emergency valve H, the engine is being worked with live steam in each cylinder.

A general description of the operations of the valves follows, the same letters in each figure referring to the same parts of the device. A receiver is placed in the smoke-box, as is the general practice in two-cylinder compound locomotives, and the high pressure cylinder exhausts into it. The receiver opens into the chamber F. The intercepting valve, shown at V in the several views, has a piston on the left end, the left of the cuts being the front end of the saddle, which piston acts as an air dash pot, to prevent slamming of the valve. Around the stem of this valve is a sleeve L, which has a longitudinal movement on the stem, and acts as an admission and reducing valve to the low pressure steam chest when starting and when working simple. Valve H is a plain winged valve with a piston on its rear end, and is called the emergency valve, as by its use the engineer can, when he so desires, operate the engine as a single expansion engine.

When starting steam from the boiler goes to the high pressure cylinder in the ordinary way. Steam, at boiler pressure, also reaches part C through a 2-inch steam pipe connected to the dry pipe. There is then no pressure in the receiver F, and the pressure on the shoulder E of the sleeve L, Fig. 2, moves the sleeve and valve V to the right, closing the receiver and letting steam pass the shoulder E into the low pressure valve chest A. The area of the end B of the sleeve is about twice the area of the shoulder E, so that when the pressure in the receiver equals or exceeds one half the pressure in the port C, the sleeve will be pushed to the left and so cut off the passage of steam from the port C to the low pressure steam chest. Thus the work is equalized between the two cylinders. One or two exhausts from the high pressure cylinder will make the pressure in the receiver sufficient to move the valve V and the sleeve to the left, cutting off communication between the steam pipe and the low pressure steam chets, and opening direct communication between the two steam chests through the receiver.

In starting on grades, or when necessary to exert the maximum power of the locomotive, the three-way cock which is located in the cab and shown in the right of each figure, can be operated to admit steam, at boiler pressure, behind the piston on the emergency valve H, see Fig. 4, and holding it open against its spring. This exhausts the small cavity J, in which the pressure is equalized with the receiver through holes in the valve V, and valves V and L are forced to the right by steam pressure on the shoulder E. With the valves in this position, the high pressure cylinder has a separate exhaust through the receiver, the cavity J, the emergency exhaust cavity and so to the main exhaust. Also the low pressure cylinder receives live steam direct from the port C. The lubricator to the low pressure cylinder enters port A, therefore constant lubrication of the intercepting and reducing valves is insured.

At speeds much above five miles an hour the locomotive will develop less power as a simple engine than as a compound engine, because the contracted exhaust of the high pressure cylinder through H, causes excessive back pressure in that cylinder, and the small passage for steam between the boiler and the low pressure cylinder decreases the initial pressure in that cylinder. This arrangement will generally force the engineer to work the engine compound except when the demand for maximum power requires that it be worked single. In case of a break-down on either side of the locomotive the engine can be run by the other side as with an ordinary locomotive.

This intercepting valve is very readily and quickly removed when necessary, but experience shows that it needs but little attention. The dash pot, sleeve and valve V, are made up before being put in place, and then they are inserted together from the front side of the saddle and secured with tap bolts.

New Starting Valves of the Baldwin Locomotive Works.

In the *Railroad Gazette* of August 18th, 1893, there was given a description of the original starting valve brought out by the Baldwin Locomotive Works for use with the Vauclain compound locomotive. This arrangement, as mentioned at that time, was being superseded by a new and simpler form which had just been devised, and of which drawings were also given. This construction is now followed by a form of starting valve which we illustrate herewith.

The function of this arrangement is the same as that of the preceding devices, and consists in draining both the cylinders, and also in providing a communication between the two ends of the high pressure cylinder, so that when a greater amount of power is required than can be obtained in compound working, steam at boiler pressure can be conducted from the port of that end of the high pressure cylinder which is receiving steam, to the port of the opposite end from which steam is exhausted to the low pressure cylinder, thus increasing the pressure in the exhaust end of the high pressure cylinder and equalizing the pressure in the two ends and increasing the pressure of steam in the low pressure cylinder. Various cards from this engine have been given from time to time in our columns, which show the effect of this action of the starting gear at low speeds. At high speeds, on account of the small size of the passage connecting the two ends of the high-pressure cylinders, the amount of steam passing from one end to the other will be but a small part of the steam taken by the high pressure cylinder at each stroke and exhausted in the natural manner in the low pressure cylinder, so that even though the starting valve is left open its effect will be greatly reduced. The object of the arrangement is, of course, to provide only for the starting of heavy trains, and it is not intended to be used except when actually required for this purpose.

Fig. 1 shows the general arrangement of this device as applied to the cylinders of a locomotive in which the high pressure cylinder is above the low pressure cylinder. The low pressure cylinders are drained by cylinder cocks of the design shown in Fig. 2, and known as the Buchanan cylinder cock. The constructon of this cock is clearly shown by the cut and needs no explanation. The high pressure cylinder is drained by a 3-way plug cock of the form shown in Fig. 3, which acts also as a

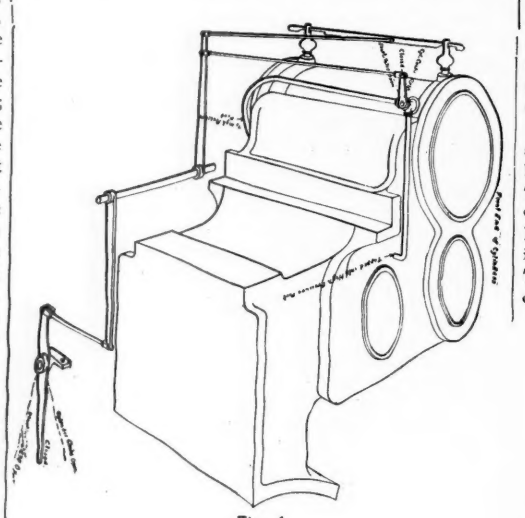


Fig. 1

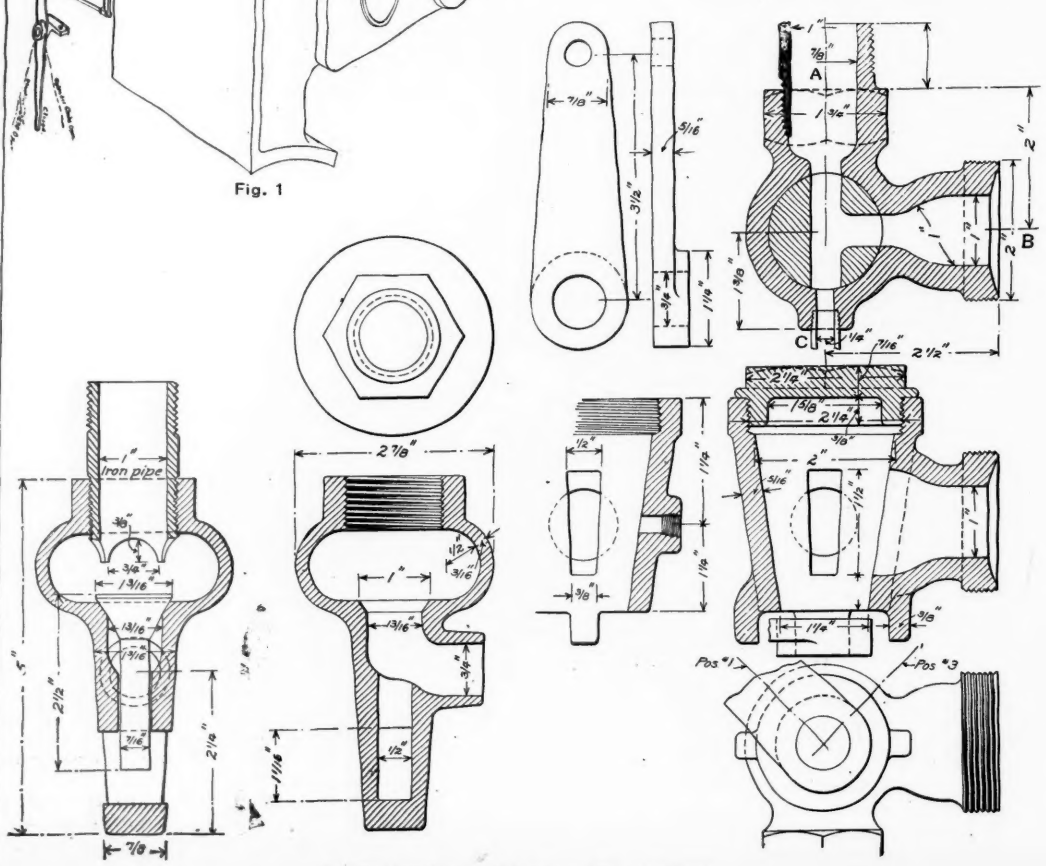


Fig. 2—New Starting Valve and Cylinder Cock.

starting valve. Position number 1 of the arm shows the cylinder cocks open. In position number 3 the plug will be turned to an angle of 90 degrees, so as to connect passages *A* and *B* leading to the ports of the high pressure cylinder, in which case steam will pass from one end of the cylinder through the pipe and valve, to the other end of the high pressure cylinder, and from there through the piston valve to the proper side of the low pressure cylinder. The position of the arm of this cock midway between the first and third positions will close all ports of this valve. Opening *C* of this valve is the one through which the condensed water from the high pressure cylinder is drained. It will at once be seen that this further simplifies the construction of this important feature of the Vauclain system of compounding, and will probably result in a considerable decrease in the cost and ease of repairs.

The Master Car Builders' Convention.

The 28th annual meeting of the Master Car Builders' Association was called to order by President Grieves Tuesday morning at Saratoga. The President of the village of Saratoga made an address of welcome, which was replied to by President Grieves, of the Association, and after the calling of the roll, he made his annual address.

THE PRESIDENT'S ADDRESS.

President Grieves' annual address had the very great merit of being short. In his opening paragraphs he takes pains to point out the fact that "the social nature of man must assert itself," and that "sociability and general good will characterizes these conventions," which amiable sentiments everybody will applaud. He reviews hastily the events of the year in the way of railroad progress, which, of course, has been much restricted by the universal hard times.

In speaking of the reports to be presented this year, Mr. Grieves says that those on Tests of Brake Shoes, and on the subject of Flanges and Gages should receive special consideration. The steel freight car truck has continued to give good results, and in some cases has been adopted as standard. It should receive most careful attention in view of the ultimate adoption of a standard truck. Meantime, it is very desirable that we should arrive at standard forms and dimensions for arch bars and other important parts of the trucks.

The President cites the well-known fact that the M. C. B. standards are but lightly adhered to by many railroads, and he suggests that it would be "entirely consistent for this Association, by resolution, to lay its recommendations before the American Railway Association."

He referred appropriately to the six members of the Association who have died within the year, namely: David H. Baker. E. Richardson, Robert Walker, C. M. Leonard, W. G. Van Buskirk and E. B. Wall.

The Secretary then read his annual report, which showed a total membership of 334, being a net increase of eight members during the year. The total number of cars represented in the Association is 1,145,125, an increase of over 30,000. The total cash collections for the year were $7,998, and the disbursements $8,019. There are about $1,000 unpaid dues. The report of the Treasurer was then read and accepted, and 11 new members were elected.

The following Nominating Committee was appointed: Messrs. Schroyer, Hodge, Packard, Barr and A. E. Mitchell. The Committee on Programme for the next meeting was appointed, being Messrs. Waitt, Soule, Rhodes, T. Anderson and R. E. Marshall. Messrs. Irvine, Barr and G. T. Anderson were appointed Auditing Committee. The constitution was amended, making the limit of time for counting letter ballots 30 days instead of 60.

A letter was read from Mr. H. G. Young, Second Vice-President of the Delaware & Hudson Canal Co., regretting that he could not accept the invitation to address the convention. This he regrets the more as it would have given him pleasure to say some complimentary things to one of the most practical and progressive associations in the railroad service.

Obituary Committees were appointed as follows.

On E. Baldwin: M. N. Forney, F. D. Adams, J. M. Wallis and S. P. Bush.

On E. Richardson: A. M. Waitt, A. E. Mitchell and Thomas Anderson.

On C. M. Leonard: George F. Wilson, J. J. Hennessy and George Gibbs.

On W. G. Van Buskirk: W. H Lewis, M. M. Martin and George L. Potter.

On David H. Baker: R. E. Marshall, E. D. Bronner, and E. D. Nelson.

The report of the Executive Committee was received and filed, and the Committee was authorized to act on its suggestion and communicate with the officers of the American Railway Association. In brief, the report was that the Rules of Interchange are made binding upon the subscribers thereto by inserting in the list of subscribers only the names of such companies as give notice to the Secretary that they have adopted the rules. The appointment of a representative member does not carry with it an adoption of the rules. It is suggested that the American Railway Association might sanction the rules if the M. C. B. Association should request such sanction, and it is thought that such action would greatly strengthen the rules, and the Executive Committee recommends that it be instructed to ask of the American Railway Association such sanction. The remainder of the report is a good argument in favor of the general adoption by the railroad of standards.

Mr. Waitt said that in examining sheet No. 2 of last year's report on the M. C. B. standard journal boxes for 3¾ x 7 in. journals, he noticed two dimensions that seemed to be in error, and asked that a committee be appointed by the chair to ascertain if there are such errors, and report during the convention. Messrs. Waitt, Soule, Blackall and McKenzie were appointed such committees.

The following were elected life members: John Kirby, F. D. Adams, C. A. Smith, George Hackett and Robert McKenna. The announcement of this compliment was followed by brief remarks from Mr. Adams, Mr. Kirby and Mr. Smith, acknowledging the honor done them. Mr. Adams suggested that Mr. Van Houten be put on the list of life members, which was done by resolution.

The first report from committees was on Indelible Pencils, the committee being Messrs. Sanderson, Mitchell and Adams. They made careful tests of a great number of pencils, and especially recommend the American carbon pencil No. 113, and American editor pencil No. 185, and make favorable mention of a number of others. This report was received and placed on the minutes, and will be considered later, in connection with the amendments to the Rules of Interchange.

Mr. Rhodes, as Chairman of the Committee on Standard Sizes for Catalogues, etc., read a report from his committee, a copy of which has not reached us.

The report on Tests of Couplers was laid over until Wednesday. The report of the Committee on Air-Brake Tests was then read by Mr. Rhodes, who said that the Committee felt obliged to recommend expunging from the record all time records, and presented a supplemental report in which a number of changes from the original were made. Until a copy of this supplemental report is received, we shall publish no abstract of the report or discussion.

The report of the Committee on Steel Tired Wheels was then taken up.

STEEL TIRED WHEELS.

The Committee on this subject consists of Messrs. R. E. Marshall, J. O. Pattee, C. H. Cory, A. E. Mitchell, H. Bartlett and T. A. Bissell. This Committee received replies from 62 members, representing abou 57 per cent. of the passenger car equipment in the country. Out of 145,820 wheels under passenger cars, 36 per cent. are steel tired. For engine, truck and tender wheels the Allen bolted plate leads with 13,943, next the Paige bolted plate, 7,369, next the Krupp solid plate 5,795, then follow the Snow boltless, the Arbel spoke, the Boies bolted plate, the Washburn, the Allen solid, and the Brunswick. There are no other makes having over 1,000 in use as reported here. The Committee reports the number of defects developed in each type of wheel, classifying them under bolted plate, spoke, and disc or solid plate, but does not work out percentages of the defects found in proportion to the number of wheels used, nor is any mileage given.

The Committee recommends that the limit of thickness for tires of steel tired wheels shall be one inch measured normally to the tread and radially to the curved portions of the flange, through the thinnest part within 4¼ inches from the back of the flange, the thickness from the latter point or outer edge of thread to be not less than ½ inch. Also that to facilitate inspection a small groove shall be cut on an outer edge of all tires at a radius ¼ of an inch less than that of the tread of tire when worn to the prescribed limit; and that these recommendations be submitted to letter ballot. The Committee submits drawings, which are reproduced in the report, and information as to the number of parts, weights, etc., of all the makes and styles of steel tired wheels now in the market concerning which the Committee was able to get this information.

Mr. Waitt thought it unfortunate to submit the matter to letter ballot in the form recommended by the Committee, as some types of wheels would be dealt with unfairly if the Committee's recommendation be finally adopted, as, for instance, the Washburn, and McKee, Fuller & Co. In these wheels the tire is supported solidly, and cannot be affected by expansion or contraction. Thousands of such wheels have been used with safety, running the tire down to half an inch, without a case of burst or cracked tire. He does not use those wheels, but wishes he did in order to get some experience with them. He hopes that a letter ballot would provide for two classes, one where the tire is solid with the centre, and the other where it is held by retaining rings or bolts.

Mr. Lentz could not give precise figures, but he thinks that his present practice is to wear down the McKee, Fuller & Co.'s wheel to ⅝ of an inch.

Mr. Adams has used that type of wheel for 25 years, and has run a great many of them down to ¼ of an inch. He does not think that good policy, however. Two years ago 50 per cent. of the wheels that were taken out of passenger service were put in freight service where they continued to run, and were found usually to do the service of 3 or 4 cast-iron wheels. Last year about 90 per cent. of those taken out were put into freight service. His company does this because there is a general idea that steel wheels should not be worn down to much less than an inch; therefore, they do not use them as long in passenger service as they might. He has never had an accident from wheels of the Washburn pattern, and thinks them the cheapest for the money.

Mr. Waitt suggested that if this question be submitted to letter ballot, it be modified to provide for a thickness of not less than ⅝ of an inch in case of wheels that have the tire and centre solid.

Mr. Mitchell asked if the Washburn wheel taken out of passenger service was put under cars going into interchange service.

Mr. Adams replied that, as a rule, he does not intend to do this, but to confine them especially to cars used on his own road, as flat cars and the like.

Mr. Gibbs asked if the Committee has any information showing the difference between the limits of tire thickness on the integral centre and bolted centre.

Mr. Marshall: There is a very marked difference between the integral locked and the other kind. It is governed by the amount of metal cutting away under the flange, also by the amount of metal shown on the outer edge as compared with that in the body of the tire.

Mr. Bush suggested as an amendment that the report of the Committee be received and printed, and the Committee be continued another year.

Mr. Lewis also brought forward arguments to sustain this action and Mr. Barr endorsed the suggestion.

Mr. Bush's motion was put and carried, but then recommitted and the matter brought before the house again.

Mr. Casanave moved that the Committee be instructed to change the recommendations in accordance with the desires of the members, and that they report at to-morrow's session or later, which was carried.

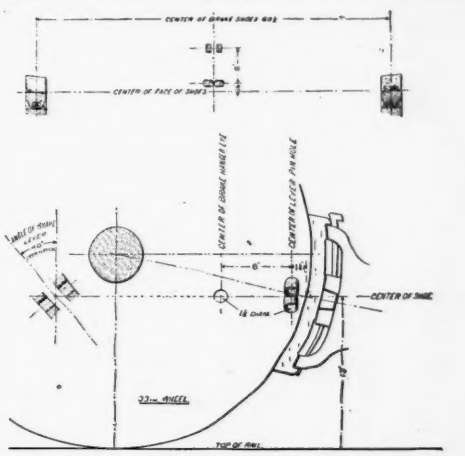
The reports of the Committees on Brake Shoes were laid over until Wednesday.

Mr. Nelson, Chairman of the Committee on Brake Beams, then read the report of his committee.

BRAKE BEAMS.

The Committee on this subject consists of Messrs. Nelson, Rankin and Bean, and its duty was to report regarding a standard location for the brake lever pin hole and brake hanger eye in a metal brake beam, and the location for the centre of the beam measured from the top of the rail. It was thought best to take as a starting point one which was absolutely fixed without reference to any particular construction of beam. A line drawn horizontally and parallel to the truck, and passing through the points of contact of the centre of the standard Christie brake shoe with the tread of the wheel, was found to fulfill these requirements, and this has been used as the reference line for the other necessary dimensions.

The Committee has not shown on the drawing attached to this report the Christie brake head adopted by the Association, for the reason that this head is intended for wooden beams or for a specific construction of metal beam, and the details showing the form of head where it is attached to the beam proper, are therefore omitted.



Proposed Standard Details for Brake Beam Location.

The Christie shoe and the parts of the head necessary to fit to the shoe are shown. There has also been omitted from the drawing anything indicating a strut. This was for the purpose of allowing other metal beams than those constructed with the strut to conform to the location of holes of such standard as the Association might decide to adopt. The two holes for the brake lever pin and the hole for the brake hanger eye are arranged on a horizontal line drawn through the centre of the brake shoe at its point of contact with the wheel. The endeavor has been to decide on the points necessary so that they will, as far as possible, conform to present practices.

Inquiry among the members of the Association was made for the purpose of ascertaining the dimensions and locations now in use. Those replying to the circular of your Committee represent 816,747 cars, those members of the Association who have the iron brake beam in use represent 546,649 cars, of which there are now equipped with a metal brake beam hung on the outside of wheels, 72,684 cars, and with a metal brake hung inside of wheels, 56,883 cars.

It was also learned incidentally that the standard distance of 60½ inches between centres of brake shoes has been adopted by a very large proportion of the roads using the metal beam. This is also true of the adoption of the Master Car Builders' standard lateral angle of 40 degrees for the brake lever. The size of holes shown on the drawing is for the beam carrying a load of 7,500 pounds.

The Committee thinks one standard height for both inside and oustide beams should be adopted, and recommends 13 inches, measured from the top of rail to centre of brake shoe, as shown.

On account of the construction of trucks it is more difficult to adopt a standard height for inside hung beams than for outside hung beams. The location chosen is considered as fair as possible to those who have inside hung metal beams, in connection with good practice.

If the Association thinks there should be one height for inside hung beams and one for outside, the Committee recommends 13 inches for inside hung beams, and 14½ inches for outside hung beams, but believes it would be better to adopt the one of 13 inches for both.

The location for lever pin hole and brake hanger eye is shown.

The report was received and filed.

Mr. Gibbs asked if the location of the centre of the brake hanger eye, 7¼ inches, inside the face of the shoe, is intended to be the brake hanger eye or the third support. This eye is usually back of the shoe.

Mr. Nelson: This is the third point of support.

Mr. Waitt moved that two questions be submitted to letter ballot, one of adopting 13 inches for the standard height of brake beams inside and out, and the other of putting it 13 inches for inside hung, and 14½ inches for outside hung.

Mr. Rhodes hoped that if the two questions are submitted to letter ballot the railroads will bear in mind that if they vote for the first question they make it a uniform height of 13 inches, making the outside hung beam just as low as the inside hung, but those who use the outside hanging ought to get all its advantages, one of which is the greater height than can be got above the rail. He thinks it looks better to see a brake shoe with its centre the height of the centre of the axle.

Mr. West thinks that the outside hung beam has the advantage that it will pass over such an obstruction as an automatic coupler falling on the track, while the inside beam, hung 13 inches high, would strike it.

Mr. Barr: The point of third support is shown level with the centre of the lever pinhole. This produces a strain on the shoes and the support should be in line with the pressure. The line of strain should be in the plane of the truss.

Mr. Waitt: The motion is not intended to include anything but the matter of height. It is a question whether the dimensions given should be adopted other than those referring to the height. The locations of the centre lever pinhole and brake hanger eye should be adjusted to balance the beam, and these locations will vary properly with different beams. They cannot be determined by inflexible rule.

Mr. Lewis: We have a standard of height for the brake rigging from the track. It would be impossible for inside hung brake beams to be placed as proposed by the committee, and the regulation is not called for in the case of outside hung. The report of the Committee will call the attention of members to points of interest, and if embodied in the minutes will accomplish all that can be asked for.

A motion was carried submitting to letter ballot the question whether the height should be 13 inchesfor inside hung beam and 14½ outside hung.

The report of the Committee on Safety Chains was then read by Mr. Coulter, Chairman.

SAFETY CHAINS FOR FREIGHT CARS.

The Committee on this subject consists of Messrs. Coulter, Simons, Carver, Day and Casey. The Committee was helped very little by replies to its circular of inquiry. Most of the members replying merely stated the fact whether or not they used safety chains on their freight cars. The conclusion of the Committee, however, is that the sum of opinion is adverse to the use of safety chains on freight cars generally, because they would not be used, would be expensive in cost and maintenance, impracticable, unreliable on account of slack, and made unnecessary by couplers. There is, however, a certain reason for using them on freight cars and low gondolas which are liable to carry loads reaching over two or three cars. While the general use of safety chains is not recommeded, standards are submitted in order to secure uniformity where they are used.

Mr. Barr: The proper course for the Association in this case is to take the sense of the meeting, for the use of chains is not to be generally recommended; that if they are called for in special cases special provisions can be made for them. He does not want to recommend for practice something that the Association does not believe in.

Mr. Rhodes held Mr. Barr's idea originally, but after reading the report of the Committee thought that its method of chaining would be desirable for certain cars and certain loads if it was uniform. For ordinary cars it would be useless, and becomes more useless every day as the M. C. B. coupler and automatic brake come into use.

Mr. Marshall: The necessity is growing greater rather than less with the introduction of four tracks.

Mr. Barr: Does any one know of cars equipped in this way?

Mr. Marshall: Our road has nearly 700.

Mr. Waitt: It is general practice where long structural iron or telegraph poles have to be carried on two cars to chain the cars together. This is an additional precaution against the terrible wreck that would follow a break-in-two with such loads. He does not think that the dimensions given by the Committee are just what they should be. The chains are located too far from the centre line of the car. In passenger equipment, 14½ inches each side of the centre is recommended, and that would be better than to put the chains 27 inches each side of the centre. In rounding curves, for instance, if the chains are not very long, trouble might ensue. A motion was carried to recommit the report to the committee for consideration of this point, the report to be brought in again later in the convention.

The convention then adjourned until Wednesday morning.

EXHIBITS AT THE CONVENTIONS.

One of the most interesting features of the conventions of 1894 is the exhibit made by manufacturers of rolling stock appliances. Nearly all were in place on Tuesday evening and attracted much attention. The following firms are represented:

The Crosby Steam Gage & Valve Co., of Boston, Mass., has an exceptionally fine display located at the centre of the main verandah, consisting of their entire World's Fair exhibit and several novelties brought out recently, among which are a mercury column and air pump for testing vacuum gages, and the Sargent electrical attachment for indicators, by means of which indicator cards may be taken from any number of indicators at the same instant. This latter device is especially fitted for use on two cylinder compound locomotives and all classes of triple expansion engines. This device is shown in practical operation, several indicators being fitted up and connected wth a cell of battery so that its action may be more fully shown. This attachment has been fully described and illustrated in this year's volume of the *Railroad Gazette*. Among the well-known articles shown are the Johnstone blow-off cock, both for locomotive and stationary boilers, their locomotive chime whistle, gage testing set and the Branden pump valve. The Crosby Company report exceptionally good results from this valve. Mr. Edward C. Bates is in charge of this exhibit.

The Meneely Bearing Co., of West Troy,, N.Y., exhibit a full size tubular bearing for passenger service, with housing and other parts pertaining thereto; also a similar bearing for street railway service. This bearing has been made standard on the Albany Railway and the Troy City Railway, the first named road having used them since first starting in 1889. The Delaware & Hudson Canal Co. have also five passenger coaches equipped with the Meneely bearing, one of which, after three and one-half years of service, is side-tracked at the Saratoga Station for the inspection of those interested. Tests on this car, made by the railway company, show a very remarkable saving in coal consumption, and in the power required to start trains from a state of rest. This company also display a thrust bearing, one of which is said to have shown very satisfactory results in tug boat service.

C. B. Hutchins & Sons, of Detroit, Mich., exhibit models showing the application of their freight car roof to cars of the usual construction, and also to the Morris roof, which is intended more particularly for furniture cars, but applicable to any style of freight car. In the Morris roof the carlines and purlines of the ordinary roof are dispensed with, the carline sheathing or under course of roofing lumber being three inches in thickness at the centre and tapering to one inch thick at the ends, where it is nailed to the side plate. These pieces are tongued and grooved, and are covered with the Hutchins plastic roofing in the usual manner. In order to prevent spreading, the car is tied together by angle irons fastened to the side plates and the carline sheathing. Roofs thus constructed have been shown to possess sufficient strength and by their use the clear height of the car is greatly increased, an important feature in furniture cars. The well-known Hutchins grain door is also exhibited.

The International Automatic Air Brake Coupler Co., of St. Louis: Automatic air brake and air signal coupler as applied to couplers of the Master Car Builders' type. This device has been in use for several months on a train of the Wabash Railroad.

The Automatic Lubricating Car Box Co., Cincinnati, O.: Improved box for passenger service.

E. E. DeKalb, Syracuse, N. Y.: System of ventilating cars by exhausting air from the interior of the car through the side windows.

The American Brake Co., St. Louis: Model showing the method of applying their brake to a 10-wheel locomotive. They also show a method of application of engine truck brakes.

The Davis Car Shade Co., Portland, Me.: Automatic shades as applied to railroad or street railroad service.

Hale & Kilburn Manufacturing Co., Philadelphia, Pa.: A number of car seats, and also a filing case for standard sizes of catalogues, pamphlets, etc., as recommended by the committee of the Master Car Builders' Association.

The Chicago Grain Door Company, Chicago: A full size working model of their grain door.

Pratt & Lambert, of New York & Chicago: A number of panels to which their "Faultless" varnishes have been applied.

The Bushnell Manufacturing Co., Easton, Pa.: Several improved car seats.

The Bellamy Co., of 243 Pearl street, New York: Samples showing the effect produced by the use of their wood fillers.

The Bundy Manufacturing Co. Binghamton, N. Y., exhibit their system of keeping time by means of a recording clock and numbered keys.

F. A. Barbey & Co., Boston, Mass., exhibit the Hampson flexible steam hose coupling, illustrated in the *Railroad Gazette* of April 27, 1894.

The A. French Spring Co., of Pittsburg: Locomotive and tender springs, car springs, box lids and a device for excluding dirt and dust from air brake couplings.

The Chicago Railway Equipment Co., Chicago: Self-adjusting spring head, as applied to the National Hollow Brake Beam.

The Evans Artificial Leather Co., Boston, Mass.: Moroccoline, a substitute for leather for covering car seats, chairs, and for carriage trimming.

The Standard Railroad Equipment Co., New York: Adams M. C. B. oil box; a journal box of the standard type, modified only to such an extent as to allow the application of a special dust guard.

The M. Ohmer's Sons Co., Dayton, O.: Dust-proof cases for filing documents, letters, cards, etc. They also show a filing case adapted to receive cards, catalogues and pamphlets of the sizes recommended by the committee of the Master Car Builders' Association. The case differs, however, from the one shown in diagram by the committee, and occupies less room, is more convenient, and excludes all dust from the interior of the case.

The Adams & Westlake Co., Chicago: Acme car window shade.

H. W. Johns Manufacturing Co., New York: Various forms of asbestos packing, gaskets, steam pipe covering, and other asbestos goods.

William Yerdon, Fort Plain, N. Y.: A convenient and practical method of applying his double hose band for steam and air-brake hose.

Wright & Jones, Bridgeport, Conn.: Window and car sash rotary locks intended for use in dwellings, stores and offices, and on passenger cars and steamboats.

W. G. Creamer & Co., New York: Car ventilators.

The Ross Valve Co., Troy, N. Y.: A fine display of valves of all sizes, and intended for a variety of purposes.

R. Bliss Manufacturing Co,. Pawtucket, R. I.: Woods' patent safety gate.

The Simonds Rolling Machine Co., Fitchburg, Mass.: Rolled bolts, pins, track bolts and other articles.

The McMillan Sash Balance Co., Pittsburg, Pa.: Sash balance and lock, combined with their "Common-sense" bead fastener.

The National Malleable Castings Co., Cleveland, O.: Car door fastener, Chapman jack, and several styles of the Butler draw-bar attachment. The latter is also shown by several framed drawings. This attachment is well known, having been variously illustrated in the *Railroad Gazette*. It is in use on a large number of roads.

The Michigau Malleable Iron Co., Detroit, Mich.: Malleable iron castings, and also the Detroit coupler and the Detroit brake-beam.

The Wilmington Malleable Iron Co., Wilmington, Del.: Diamond coupler and the Brown draw-bar attachment.

The Sams Automatic Car Coupler Co., Denver, Col.: Automatic link and pin coupler.

Isaac G. Johnson & Co., Spuyten Duyvil, N. Y.: Thurmond coupler.

The Standard Steel Works, Philadelphia: Steel-tired spoke and plate car wheels.

Pratt & Letchworth, Buffalo, N. Y.: Mallaeble iron castings, among which are several styles of brake heads and the Pooley coupler. Several couplers of open hearth steel are also exhibited.

The National Car Wheel Co., Buffalo, N. Y., works at Depew, N. Y., and Chicago, Ill.: Car wheels, some of which are in sections.

A. La Rue, Danville, Penn.: Model of the Great Automatic Car Coupler—a coupler of the M. C. B. type.

The Crowley Car Coupler Co., Youngstown, O.: Model of an automatic link and pin coupler.

The Hendrick Mfg. Co., Carbondale, Penn.: Perforated sheet metal.

Strait & Smith Co., New York & St. Paul: Brown emergency M. C. B. coupler.

The American Dust Guard, Columbus, O.: Full size dust guard.

Adjustable Saw Table Co., Fitchburg, Mass.: Model of Farwell's adjustable saw table.

American Railway Electric Light Co., New York: Blue prints of their system for lighting cars. This system was illustrated in the *Railroad Gazette* June 8.

R. E. Tilden Co., Chicago: Car and locomotive replacers.

Buckeye Automatic Car Coupler Co., Columbus, O.: Model of a car platform equipped with pressed steel end sill and buffer.

The Marden Car Brake Co., Boston: Marden steel brake-beam and Marden's improved bell cord hanger. This hanger is novel, being a strip of highly tempered watch spring steel, covered with leather and with bronze trimmings.

Fairbanks, Morse & Co., Chicago: Barrett track jack; 7 by 5 by 10 in. pump; Sheffield Velocipede Car Co.'s hand car; a model of a locomotive stand pipe, after the designs of the latter company.

Dyer Williams, Chicago: Williams' No. 4 All Steel Coupler, his latest design. This coupler, as tested by the Chicago Tire & Spring Co., stood three drops at 10 feet, and 12 drops at 15 feet. In pulling tests, made by the Solid Steel Co., equally good results have been shown.

The Springfield Malleable Iron Co., Springfield, O.: Ludlow automatic freight car coupler and models of couplers intended for use in freight and passenger service. The Miner draw-bar attachment is also shown by models. This attachment has been for several years past in heavy refrigerator car service and has shown excellent results.

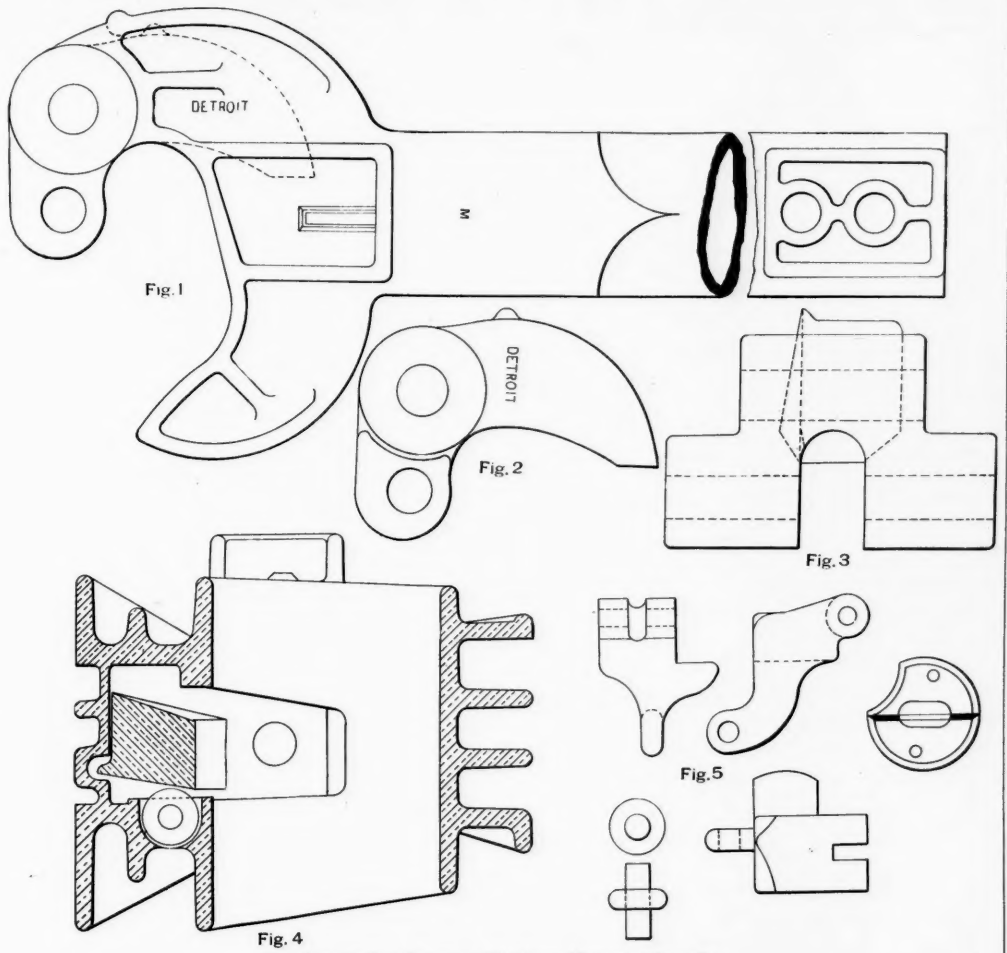
The Kansas City Steel & Iron Works, Kansas City, Mo.: Kansas City coupler and several samples of the Cline

crucible steel, which has been found to be especially well suited for the manufacture of fine tools and shows excellent cutting qualities.

The Peerless Rubber Manufacturing Co., New York: A fine display of steam and air-brake hose, gaskets, pump valves and packing for valves, valve rods and gage glasses. The "Anaconda" hose and Peerless diamond mats are among the specialties of the company.

a new design of coupler opening from the lower side of the head, and intended for low platforms. A locomotive tender coupler and buffer is also shown. A malleable iron draft beam intended for use with the American continuous draw-bar rigging is one of the new features first brought out by this company.

J. C. Barber, Master Car Builder of the Northern Pacific Railroad Co.: Model of a new four-wheel passenger truck,



The Detroit Car Coupler—Michigan Malleable Iron Co.

The Kinsman Block System Co., New York: A very complete exhibit showing the application of their apparatus to a locomotive and with the necessary track connections on a reduced scale to fully show its method of operation. The apparatus pertaining to the locomotive is supplied with air from a 9½ in. Westinghouse pump. The Kinsman system is now in operation on the Chicago, Milwaukee & St. Paul Railway, and was described and illustrated in the *Railroad Gazette*, June 8, 1894.

L. C. Chase & Co., Boston, Mass.: Mohair plushes of several different shades and patterns for car seats and other purposes. An instructive feature of the display is a case of samples showing the appearance of the wool in the various stages of manufacture from the raw material to the finished product.

Syracuse Malleable Iron Works, Syracuse, N. Y.: Burns' Automatic M. C. B. Coupler, illustration and description of which will be found on another page of this issue of the *Railroad Gazette*.

H. L. Leach, Boston: Leach's improved sand feeding apparatus.

Jenkins Bros., New York: Valves, packing and steam fitting specialties.

Manning, Maxwell & Moore, New York: Metropolitan injector, manufactured by the Hayden & Derby Mfg. Co.; Tabor indicators, gages, etc., made by the Ashcroft Mfg. Co., and locomotive pop valves by the Consolidated Safety Valve Co., all of Bridgeport, Conn., and of which they are the selling agents.

M. C. Hammett, Troy, N. Y.: Cory force feed lubricator described in the *Railroad Gazette* of January 5, 1894. One lubricator is mounted and in working order, while another is shown in section and shows its construction. The Tornado ventilator also forms a part of the exhibit.

The Taylor Iron & Steel Co., High Bridge, N. J.: A number of steel castings, among which are a heavy manganese steel wheel, and an improved interlocked and welded steel-tired wheel. The manganese steel wheel shown weighs 675 pounds, and was dropped on a solid iron base twice each from heights of 10, 15, 20 and 25 ft., and four times from a height of 30 ft. The wheel struck each time on the same point of the flange, but showed no cracks, the flange and tread being but slightly bent inward.

The Hinckley Brake Co., Trenton, N. J.: Brake slack adjuster, brake pressure regulator and truck bolster, together with working drawings and blue prints of same.

The Gould Coupler Co., New York: A full size passenger buffer, coupler, platform and vestibule. On a separate frame are shown a locomotive pilot coupler, a freight car coupler and new freight buffer. Also on the same frame the framework of which is constructed from channels, beams, angles and other rolled shapes. Coil springs are located above the boxes and elliptic springs between the upper and lower bars of the side frame, these springs being at right angles to the usual direction and lying entirely within the frame. Two bolsters are used and bridged across in the manner common to six-wheeled trucks.

The Consolidated Car Heating Co., Albany, N. Y. Complete equipment of valves and fittings for steam heating with bromide prints of various other parts of their equipment. Their system of electric heating for street cars is fully shown by apparatus set up as in service, and supplied with a current from the street railway circuit. This company is exploiting the Pope system of lighting by compressed oil gas, which has been used on several English railroads since 1886, and is now in use on 18 different roads, including the London & Northwestern, the Lancashire & Yorkshire, the Great Northern and the North Eastern. The total number of cars equipped at the present time is about 14,000, while contracts are now being executed for equipment on 14 roads.

The Safety Car Heating & Lighting Co., New York: A handsome exhibit of their "Pintsch" system of lighting cars is located in the main office of Congress Hall. This consists of a tank of gas supplying three lamps, two of which are of the more common pattern, and the third is a new design. This lamp is called the "deck" pattern, the globe being quite close to the roof and of cut glass. The design and general appearance of the lamp is more in harmony with the present style of car decoration, and will be used on Pullman palace cars, on whose equipment, as well as on that of the Wagner Co., the Pintsch system is the standard. It is a beautiful light.

Gold Car Heating Co., New York: A part of this exhibit is located in the centre of the court, and consists of a rack supplied with steam and carrying various parts of the company's apparatus, among which are their locomotive pressure regulator, self-draining train pipe valve, steam hose couplings of the various types controlled by this company, gravity and spring relief traps, vertical non-freezing steam traps and various details of their systems. There is also shown their new jet system of hot water circulation in connection with the Baker heaters. recently illustrated in the *Railroad Gazette*. On the veranda are various other features, among which are shown their duplex coil system of double circulation in connection with the Baker heater, their terra cotta storage heater and salt water storage heater. Sections are also shown of the various appliances and fittings of this company.

The Detroit Coupler.

The engravings show a new vertical plane, M. C. B. coupler, which is now being put on the market by the Michigan Malleable Iron Co., of Detroit. Fig. 1 shows the plan of the coupler with the knuckle in position. Fig. 2 shows the knuckle looking from the top, and fig. 3 as it appears from the end. Fig. 4 is a section through the coupler head and shank of the knuckle, and fig. 5 shows a detail of the locks and the opening device. The small roller in the head permits the knuckle to open automatically. This roller is shown in fig. 4. The ribs on the back of the drawhead where the knuckle is put are unusual, and strengthen the head considerably at this point. These are shown in fig. 4.

The Burns Automatic Coupler.

The Syracuse Malleable Iron Works, Syracuse, N. Y., have recently brought out a vertical plane coupler of the M. C. B. type, as shown in the accompanying cuts, fig. 1 representing the coupler open, and fig. 2 closed. This

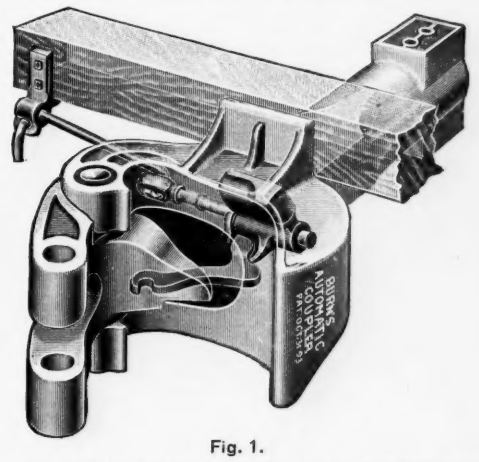


Fig. 1.

coupler consists of four parts, the body, knuckle, lock and knuckle opening device. The body is made of malleable iron and all other parts of cast steel.

The locking device is very strong and lies between the knuckle and outer wall of the coupler, and when the knuckle is closed renders it impossible to uncouple when train is in motion. The knuckle opening device is positive, and the knuckle is thrown open by the same motion

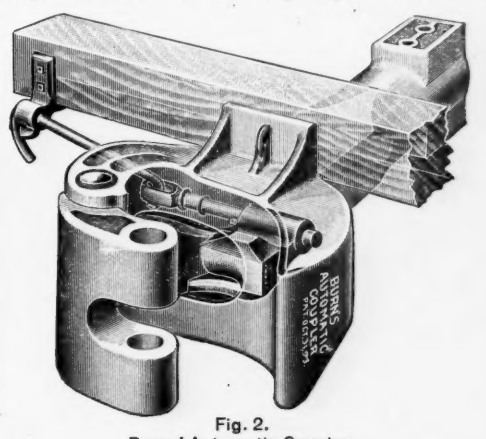


Fig. 2.
Burns' Automatic Coupler.

of the lever that unlocks the coupler. This coupler locks from the side instead of from the top, and avoids the filling of the head with snow, ice and dirt through the holes in the top. This coupler has had a thorough trial in service and has been subjected to very severe service tests without developing weakness or failing to perform its work; also, it has been tested under the M. C. B. proposed rules and has met the tests fully. It has been tried on a branch of the New York Central Railroad and has been developed to be a practical device on that road.

Draining the Zuider Zee.

A royal commission of 26 members, which has for a long time been studying the best mode of draining and reclaiming the Zuider Zee, has at length reported, 21 out of the 26 commissioners recommending that the projected work be carried out. The drainage is to be accomplished by bulding a sea dyke from Northern Holland to Freisland. This will reclaim about 450,000 acres, which will have an estimated salable value of 326,000,000 guilders. The total estimated cost of the undertaking is 315,000,000 guilders. This includes compensation to the fishermen, who will lose their present means of subsistence by the execution of this project. The estimated value of the land to be reclaimed seems to be in the neighborhood of $300 an acre. Some 460 square miles now under cultivation in Holland has been reclaimed during the present century. The largest "polder," 43,310 acres, is at Haarlem. The drainage of the Haarlemmermeer was effected between 1840 and 1852. The total expenditure, including interest, was 13,789,377 guilders, and the value of the ground sold and retained by government was 8,032,781 guilders. There is one other polder of about 12,500 acres, and the building of the North Sea Canal reclaimed about the same amount of land.

RAILROAD GAZETTE

EDITORIAL ANNOUNCEMENT.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

One of the most suggestive paragraphs in the annual address of the President of the Master Car Builders' Association is that in which he proposes to bring the recommendations of the M. C. B. Association before the American Railway Association. Of course the object would be to get the latter Association to lend its weight to the standards of the former and thus to help in securing adherence to those standards by the various railroad companies. Doubtless, approval of the M. C. B. standards by the American Railway Association would add to their weight with many railroad officers, and would promote to some degree, perhaps to a considerable degree, the strict use of those standards; and yet nobody should go away with the idea that approval by the American Railway Association would involve the adoption of a standard. This would by no means be the case; the powers of this Association like those of the M. C. B. Association are simply recommendatory. The recommendations of each Association have weight, and to many minds, and before many courts and other bodies, are presumptive evidence that the things recommended are good. So, if the M. C. B. Association can agree to act with the American Railway Association, and if the latter body will undertake to pass upon and approve or disapprove the standards of the former, the outcome will probably be for good; but we do not attach very great importance to such action. Fortunately, the whole spirit of this nation is against bureaucratic methods in all affairs, public or private, and the body which undertakes to set up standards of practice or rules of conduct must demonstrate that its standards or rules are the best that are available to the majority. No peculiar sanctity attaches to the dictum of any of these associations; what they say must be wise or it will not go far or endure long. This both of these associations recognize fully, as a rule, and hence their care in action.

We have received from Mr. E. St. John, General Manager of the Rock Island, and Chairman of the General Managers' Association, the report of that association's committee on length of rail. The committee was appointed in May, 1893, and has held several meetings and accumulated considerable information. The names of the members of the committee are as interesting as any part of their report; they are Messrs. Rodd, Mordecai, Whittemore, Handy, Becker, Baldwin, Blake, Torrey, McFarlan, Wallace and Carter, all of which will be recognized as the names of well-known Chief Engineers or Assistant Chief Engineers. The report contains little information in addition to what was given in our editorial of May 18, page 356, although it gives some specific details that we did not possess at that time. The committee finds in use 30 miles of 60 ft. rails on the Pennsylvania Railroad east of Pittsburgh, 27 miles on the Norfolk & Western, one-quarter of a mile of 45 ft. rail on the Lehigh Valley, and a short piece of 60 ft. rail on the Nashville, Chattanooga & St. Louis. It is noticeable that the rather important experiment of the Pennsylvania lines west of Pittsburgh with 33 ft. rails is not mentioned. This, we suppose, is because that experiment is so new. The inquiry shows that no serious difficulty has been found in transporting, laying and maintaining 60 ft. rails and that these are preferable to any other length above 30 feet on the score of economy. The committee estimates approximately an economy, with 33 ft. rails of $40 a mile in first cost of joints and $8 a mile in maintenance and renewals of joints; with 60 ft. rails $220 a mile in first cost of joints, and $44 in maintenance, etc. The reducing of the number of joints gives advantages greater than the economy appears to indicate, as the liability to trouble at the joint by its breakage or by the breaking of rails at the bolt holes is considerable. The rolling mills do not appear to be anxious to make rails above 30 ft. long. Naturally this is so, but the Norfolk & Western buys 60 ft. rails at an increase of but $2 a ton. The objection to 60 ft. rails on the score of great expansion and contraction the committee does not think a very serious one. It is recommended that each road should lay a number of miles of 60 ft. rails and watch their performance carefully, making proper reports; and it is advised that the experiment should go at once from 30 ft. to 60 ft. rails, and that intermediate lengths should not be tried. This may be wise, but we do not see why 33 ft. rails, which can be bought at the scale prices and transported on single existing cars, should not be tried if one does not want to try 60 ft. rails. They would save 10 per cent. of the joints.

Internal Friction of Locomotives.

The internal friction of locomotives has long been a matter of conjecture. The only locomotive tests that approach reasonable accuracy as to internal friction are those made at Purdue University, by Prof. Goss; but these results vary considerably from each other, and, as will appear from what follows, there is good reason for such variation, arising mostly from difference in lubrication, it being exceedingly difficult to maintain anything like uniform lubrication on locomotives with the ordinary oiling apparatus. It is shown later here how wide a variation can be produced in the total of friction locomotives with a slight variation in the degree of lubrication.

The most important analysis of the friction of steam engines is that made by Prof. J. E. Denton, of the Stevens Institute of Technology, and published in the *Stevens Indicator*, of April, July and October, 1890, pages 136, 209 and 348. On page 209 on "The Internal Friction of Steam Engines," Prof. Denton describes a method of calculating very closely the friction of steam engines and corroborates the accuracy of the method by application to engines that have been practically tested for internal friction. The closeness of the calculations to the actual results is surprising as well as gratifying. We have undertaken to apply this method to steam locomotives, and the results are given in the accompanying diagrams and tables. Prof. Denton's method for stationary engines is as follows:

As all pressures are upwards of 40 pounds per square inch, it is assumed that some co-efficient of friction between 5 and 10 per cent. will apply to all external bearings.

The friction of the stuffing boxes or piston rods is assumed at 6 pounds per square inch of diameter of the rod. Measurement of the friction of packing, in the case of a small steam engine, affords this data, which, though meagre, is all that is available, and, as will be seen, no essential error follows from its approximate character.

The friction of the slide valves is computed on the assumption of a mean unbalanced pressure equal to half of the boiler pressure and a co-efficient of friction of 10 per cent., which is deduced from Mr. Gidding's experiments with his valve dynamometer, Vol. 7, *Transactions* American Society of Mechanical Engineers.

The thrust upon the eccentric is taken at 25 pounds more than the force to overcome friction in valve mechanism.

The piston ring friction is computed on the assumption of 10 pounds pressure under the rings, and 2 per cent. co-efficient of friction. This pressure is known as nearly that due the piston springs, and the rings were so snugly fitted that no sensible steam pressure could be beneath them. The co-efficient of friction accords with that determined for good lubrication by the writer's experiments on the friction of packing rings in steam cylinders. See Volume 10, *Transactions* American Society of Mechanical Engineers.

The sum of the friction of the pistons, stuffing boxes and valves, only amounts to about 6 per cent. of the entire friction of the machine. Consequently the approximate character of the constants upon which these items are based, cannot introduce any important discrepancy into the calculations of the friction of the other parts of the machine.

We have followed this plan excepting in the matter of crank pin friction, which we have taken at 10 per cent., as the lubrication of crank pins on locomotives is somewhat imperfect, and 10 per cent. has been added to the eccentric friction to include the friction of the link block and rocker, both of which are very small.

Before entering upon the description of the process, it is necessary to say that there is a wide difference between lubrication of ordinary machinery and the lubrication of car journals. This is well set forth by Prof. Denton.

If, however, the student of lubrication turns to the literature of modern investigators with lubricants, he finds that by the experiments of Thurston, Woodbury, Tower, etc., the friction between lubricated metallic surfaces, such as prevail in machine bearings, is not directly proportional to the pressure, is not independent of the speed, and that the co-efficients of Morin and Webber are regarded as about tenfold too great for modern journals. The writer has offered an explanation of this apparent contradiction of authorities by showing, with laboratory testing machine data, that Morin's laws hold for bearings lubricated by a restricted feed of lubricant; such as is afforded by the oil cups common to machinery. Whereas the modern experiments have been made with a surplus feed or superabundance of lubricant such as is provided only in railroad car journals, and a few special cases of practice.

That the low co-efficients of friction obtained under the latter conditions are realized in the case of car journals, is proved by the fact that the temperature of car boxes remains at 100° at high velocities, and experiment shows that this temperature is consistent only with a co-efficient of friction of a fraction of one per cent. Deductions from experiments on train resistance also indicate the same low degree of friction. But that these low co-efficients do not account for the internal friction of steam engines as well as do the co-efficients of Morin and Webber, has not to my knowledge been shown, and it is the object of this writing to show that this is a fact by comparing the calculated friction of a number of engines with the friction as determined by measurement.

If the locomotive driving axles are considered to be as well lubricated as car journals, then the co-efficient of friction must be taken very low, but if there is any restriction of the lubricant, as may frequently happen, then the co-efficient rises and the friction is greatly increased; in fact it may vary all the way from ½ of one per cent. to 10 per cent., and in reading the tables giving the results of the Purdue tests it must be remembered that no means were provided for maintaining a constant degree of lubrication, and this alone will account for all the variation in the internal friction found from those tests, excepting a few cases where the friction is too low to be correct. In table A are given the results of the calculation we have made on Prof. Denton's plan, of the friction of the Purdue Locomotive under the conditions under which it was tested. For details of the tests see *Transactions* of the American Society of Mechanical Engineers, volume 14, 1893, page 826.

Table B gives the friction by calculation and that obtained from the actual tests of the Purdue University locomotive, and shows what a wide variation there must have been in the axle journal friction to account for the difference in the total friction of the locomotive.

TABLE A.

This table gives the results of the calculations of the friction of the Purdue University test locomotive, based on Prof. Denton's plan of calculating the friction of stationary engines. The figures in the Table give the horse power absorbed by the friction of the different parts on one side of the engine. The figures for the total engine are twice those given in the Table. The thrust on the driving axle bearings and the journal friction due to the weight of the engine and the engine truck journals are not included in this Table.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Piston in Cylinder	0.15	0.14	0.15	0.14	0.15	0.15	0.15	0.23	0.23	0.23	0.23	0.23	0.14	0.14	0.15	0.25	0.25	0.24	0.24	0.23
Piston Rod Packing	0.49	0.48	0.49	0.48	0.48	0.48	0.77	0.78	0.78	0.78	0.78	0.78	0.47	0.46	0.49	0.83	0.79	0.80	0.78	0.78
Valve Rod Packing	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
Slide Valve	0.31	0.23	0.20	0.16	0.15	0.13	0.56	0.44	0.35	0.31	0.27	0.23	0.38	0.31	0.30	0.61	0.58	0.54	0.47	0.61
Eccentrics and Valve Motion	0.25	0.19	0.16	0.12	0.11	0.90	0.45	0.33	0.27	0.23	0.18	0.14	0.29	0.22	0.21	0.48	0.41	0.34	0.30	0.43
Cross Heads	0.25	0.25	0.25	0.25	0.25	0.25	0.40	0.40	0.40	0.40	0.40	0.40	0.49	0.48	0.50	0.82	0.80	0.80	0.79	0.78
Main Crank Pin	1.90	1.90	1.90	1.90	1.90	1.90	3.00	3.00	3.00	3.00	3.00	3.00	3.40	3.40	3.40	5.80	5.60	5.60	5.60	6.90
Front Parallel Rod Pin	1.00	1.00	1.00	1.00	1.00	1.00	1.70	1.70	1.70	1.70	1.70	1.70	1.90	1.90	1.90	3.30	3.20	3.20	3.20	3.80
Back Parallel Rod Pin	0.75	0.75	0.75	0.75	0.75	0.75	1.20	1.20	1.20	1.20	1.20	1.20	1.30	1.30	1.30	2.40	2.30	2.30	2.30	2.60
Totals	5.12	5.06	4.92	4.92	4.81	5.63	8.22	8.11	7.96	7.88	7.79	7.72	8.39	8.33	8.27	14.52	13.96	13.85	13.71	16.16

TABLE B.

(1)	(2)	(3)	(4)	(5)	(6)
22.35	10.24	12.11	.05	106	1
17.43	10.12	7.31	.03	103.1	2
23.37	9.84	13.53	.06	104.7	3
14.86	9.84	5.02	.02	102.9	4
20.60	9.62	10.98	.05	103.7	5
14.25	11.26	3.99	.02	104	6
46.85	16.44	30.41	.08	165.5	7
38.91	16.22	22.69	.06	166.8	8
42.97	15.92	27.05	.07	167	9
53.17	15.76	37.41	.10	167.4	10
38.79	15.58	23.21	.06	166.5	11
21.97	15.44	6.53	.02	166.5	12
22.06	16.78	5.28	.02	200.8	13
15.56	16.66	1.10	.	209.3	14
34.06	16.54	17.52	.06	210.5	15
44.09	29.04	15.05	.03	353.9	16
73.87	27.92	45.95	.09	338.4	17
71.09	27.70	43.39	.09	341.2	18
56.84	27.42	29.42	.06	335.7	19
57.62	32.32	25.30	.05	395	20

This table gives the calculated friction and that obtained from actual tests of the Purdue University locomotive.

Col. 1 is horse power absorbed in friction from actual tests, it is the total of locomotive not including engine truck.

Col. 2 is horse power absorbed in friction obtained by calculation of parts, not including the driving axle journal friction and the thrust on those journals.

Col. 3 is the difference between columns 1 and 2, being the estimated horse power absorbed in the friction of the driving axle journals due to the weight thereon and the thrust of the pistons.

Col. 4 is the co-efficient of friction of the driving axle journals determined from the journal velocity and column 3.

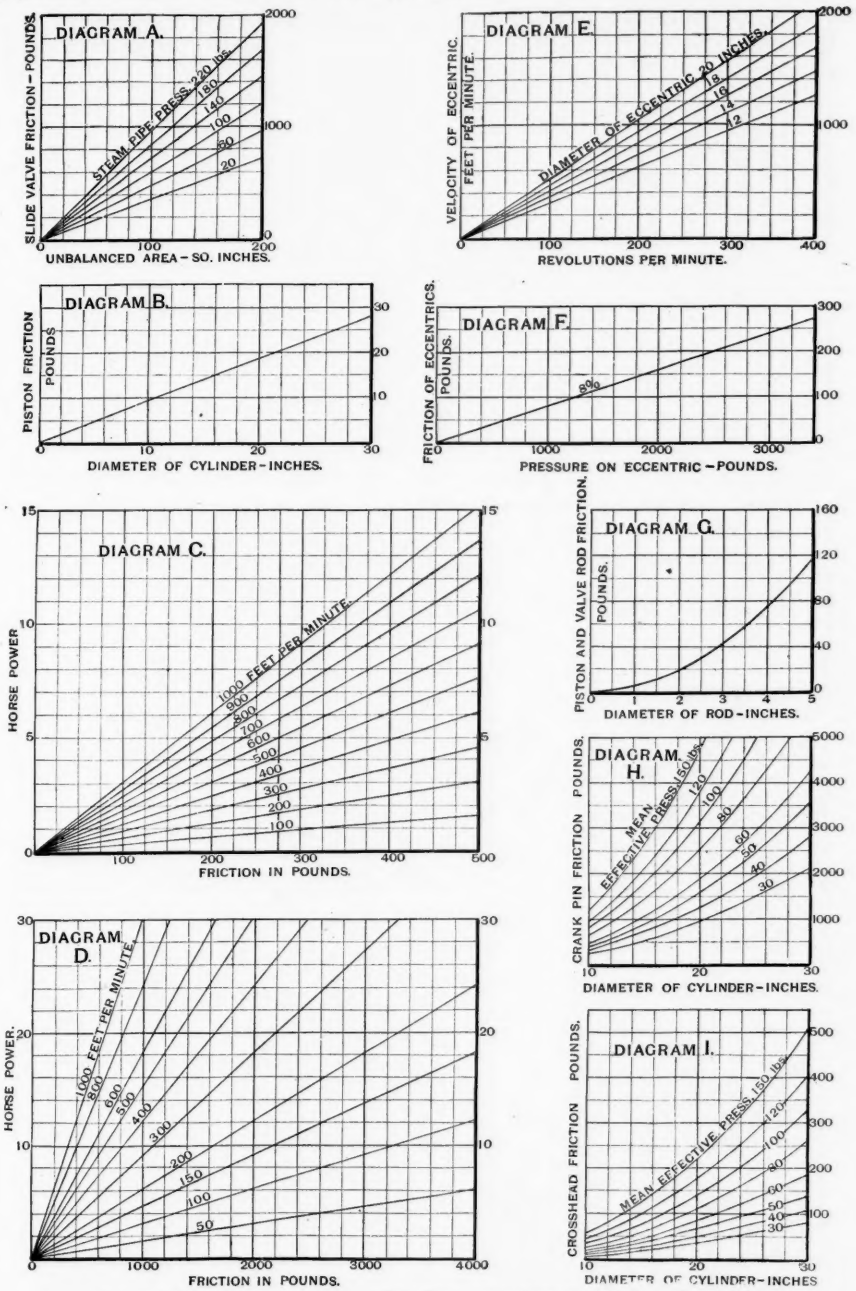
Col. 5 is the total indicated horse power of the locomotive obtained from actual tests.

Col. 6 is the number of test.

The tender and engine truck journal friction may be taken as the same as that of the cars of a train and can be calculated in the ordinary way, and may be found

approximately from the common data available regarding the resistance of trains and the friction of car journal boxes.

The friction of the slide valves in these calculations has been taken from the results obtained from tests of balanced slide valves made on the Chicago, Burlington & Quincy by Mr. Philip Wallis, now on the Norfolk & Western Railroad. These results were given in Mr. Quereau's paper on Steam Distribution for High Speed Locomotives before the Western Railway Club. The method of calculating the friction of a steam locomotive on this basis is as follows:



Internal Friction of Locomotives—The Diagrams show the Friction of one side.

Slide Valve Friction, Diagram A:—The unbalanced area inside of the slide valve is obtained by subtracting the area inside of the balancing strips on top of the valves from the area of the seat bounded by the outer edges of the steam ports, that is, the product of the length of the steam ports by the distance between the extreme edges of the two steam ports lengthwise of the cylinder. Based on the C. B. & Q. tests, and those of J. A. F. Aspinall, of the Lancashire and Yorkshire Railroad, England, given in the *Proceedings* of the Institution of Civil Engineers of Great Britain, 1889, and the experiments by Mr. Giddings given in the *Transactions* of American Society of Mechanical Engineers, Volume 7, 1886, all of which closely approximate to 6 per cent. of the pressure on the valve found by multiplying the steam pressure by the unbalanced area. Diagram *A* gives a total friction of one valve for different steam pipe pressures.

Piston Friction, Diagram B:—This friction is taken from the tests made by Prof. Denton which gave a total friction of about 2 per cent. of the pressure on the piston packing, which is assumed to be 10 per cent. per square inch on two 3-inch packing rings. This matter is referred to more in detail in what precedes. The diagram *B* gives a total friction of one piston of different diameters.

Horse-power Diagrams C and D:—Diagrams *C* and *D* give the horse power absorbed in friction with different amounts of frictional pull in pounds and with different speeds of the surface in contact. The diagrams are drawn to a different scale to assist in reading them, but otherwise they are identical. The following is an example of the use of these diagrams: Supposing the total friction of a given part is 400 pounds and the velocity of the surface is 400 feet a minute. It will be seen from these diagrams that the horse power absorbed in friction is about 5. The use of these diagrams comes after the frictional pull of the different parts in pounds has been obtained from the other diagrams. The method of tabulating the friction of a locomotive is given in table *C*.

TABLE C.—HORSE POWER ABSORBED IN FRICTION ON ONE SIDE.

General Data.	Engine No. 1.	Engine No. 2.
Circumference of cylinder, inches	227	227
Piston speed, feet a minute	326	512
Revolutions a minute	82	128
Steam pipe pressure	104	114
Mean effective pressure in cylinders	29	65
Circumference of eccentrics, feet	4.2	4.2
Velocity of surface of eccentrics	351	550
Mean velocity of slide valves per minute	40	72
Velocity of surface of main crank pin	97	151
" " " " front parallel pin	106	167
" " " " back parallel pin	75	116
Unbalanced area of slide valves, sq. inches	41	41
Weight on driving axles, pounds	41,000	41,000
Diameter of valve rod, inches	1¾	1¾
Total friction one side of engine in pounds:		
Piston	.15	.23
Piston rod	.49	.78
Crosshead	.25	.78
Main pin	1.90	6.90
Front parallel pin	1.00	3.80
Back parallel pin	.75	2.60
Driving axle due to thrust	..	..
Driving axle due to weight on journals	..	..
Slide valves	.31	.61
Valve rod	.02	.02
Eccentric and valve motion	.25	.43
Total horse power absorbed in friction on one side, not including driving axles	5.12	16.16

Velocity of Surface of Eccentrics, Diagram E:—This diagram gives the velocity of the surface of the eccentric for different revolutions a minute and different diameters.

Friction of Eccentrics, Diagram F:—This diagram gives the friction of eccentrics found as follows: Add the frictional pull of the slide valve and the valve rod together and then add 10 per cent. to this to include the link block and rocker arm friction. On this diagram the rocker arms are taken as practically equal in length. The friction is taken at 8 per cent. of the pressure on the surface of the eccentric.

Piston and Valve Rod Friction, Diagram G:—This diagram gives the friction pounds for different diameters of rods based on 6 pounds per square inch of the diameter of the rod (Prof. Denton's basis).

Friction of Crank Pin, Diagram H:—This diagram gives the friction in pounds based on 10 per cent. of the pressure on the pins for different mean effective pressures and different diameters of cylinders. In a locomotive the friction of the parallel rods must be considered with some care. Take for instance an 8-wheeler; all the pressure on one side goes first to th main rod bearing and about one-half of this is transmitted to the rear wheel through both parallel rod bearings. All the piston pressure is on the main pin, but one-half of it is transmitted to two other pins, therefore three bearings have to be included in the calculations. The diagram only considers the friction of the main rod bearing, and with 8-wheelers half of this must be put on each of the two parallel rod bearings and the horse power absorbed in friction must then be found from the diagrams *C* and *D*.

Crosshead Friction, Diagram I:—This diagram gives the Crosshead friction in pounds, based on 8 per cent. friction and with an allowance for the weight of the crosshead, the engine being supposed to be running ahead. The weight of the crosshead reduces the pressure on the guide somewhat. This diagram is approximate only and should be varied for extreme designs if a very close calculation is desired; however, it will appear from the table *A* that the friction of the crosshead is but a small per cent. of the total friction. It is important to know, in connection with these diagrams, that the principal part of the internal friction of locomotives, where balanced valves are used, is found in the crank pins and main journals, and considerable errors, even to the extent of doubling the friction of the other parts, will not materially alter the per cent. of power absorbed in friction; in fact the friction of the crank pins and journal bearings is such a large percentage of the total friction that an approximate estimate of the friction of the other parts, which can readily be made from the diagrams, would give results quite accurate enough for useful work.

In reading the horse power diagrams *C* and *D* for small pressures and velocities, it is better to multiply the pressures and velocities by 10 or 100 and divide the results by these figures in order to read the diagrams more accurately. This can be done with all the diagrams except *G*, *H* and *I*, which have curved lines and must be read strictly according to the figures at the sides.

There are some interesting deductions that may be drawn from these results, and one is that some of the differences found between locomotives tested in service are not so great as the differences that may exist in the friction of the axle journals and crank pins, and a better degree of lubrication will give one locomotive a decidedly better efficiency than another; in fact in some cases where an engine has been claimed to be 10 per cent. more economical than another; there may have been a difference in lubrication that would account for the entire difference in efficiency. It is evident, therefore, that in testing locomotives the indicated horse-power as well as the dynamometer horse-power should always be determined in order to learn the difference in internal friction.

It will be seen that consolidation locomotives having several side rods and large driving axle journals and small wheels, may absorb a considerable percentage of power in internal friction, as the greater part of the internal friction is found in these parts. Some rough calculations of the friction of some decapods gave the internal friction as more than 20 per cent. with fairly good lubrication. All of this goes to show the great value of laboratory tests of locomotives as it is only by such tests that a comparison between the efficiencies of different types of locomotives can be learned. Of course the *practical* efficiency can only be determined from actual service, but nevertheless there are essential matters, among which is the internal friction, that can never be determined except by a test of a locomotive under conditions that can be kept constant, and such conditions are only found in laboratories.

Purdue Laboratory.

The restoration of the Purdue Laboratory at La Fayette, Ind., recently destroyed by fire, is being pushed forward rapidly. The locomotive "Schenectady" has been returned to the University from the Pan Handle Shops at Indianapolis, where it has been put in thorough repair. The engine was backed in over the new track, into the Annex Laboratory, and directly upon the carrying wheels of the testing apparatus, all under its own steam. This indicates the ease with which the new Annex Laboratory may receive any locomotive for testing.

The Saratoga Convention.

The twenty-eighth annual meeting of the Master Car Builders' Association just concluded at Saratoga, was perhaps quite as important as any for a number of years, especially in matters that pertain to the interchange of cars. The reports of committees are not particularly important except the one relating to the gaging of wheels on the axles and the thickness of the flanges. The discussion of this subject had a vigor and force that shows how great is the general interest and the feeling seems to be that this matter has been neglected far too long. It is openly said that lack of co-operation between the track and car departments has led to evils that require immediate attention. The results of the neglect have been broken wheel flanges, damaged frogs and derailments of freight cars. The step now taken will lead at once, we may hope, to a more uniform thickness of flanges and a better location of guard rails at frogs.

The report on compressed air and hydraulic machinery is particularly interesting to those who are looking for labor-saving devices, and the suggestions contained in the report on the lubrication of cars, will, if followed, make considerable saving on many roads. The committee on air-brake tests have changed their preliminary report considerably on account of some inaccuracies in the chronograph records. It was decided at least to omit all of the records that pertain to the quickness of application, rather than to publish what is not strictly correct. The records already given out, and published in the *Railroad Gazette*, are correct in the main, but are not to be taken as final, nor as accurate enough for a close comparison. Those records show the brakes, one and all, as having a quicker action than is really the case. This has been determined from tests made since June 1. The comparisons made from the first tests are not unjust to any, but the time of action is too short for all. The revised report will be given to the press as soon as it is completed.

The failure to report definitely on the best metal for brake shoes is a disappointment to many, but so much substantial progress has been made by the committees that all look forward to a complete exposition of this important matter next year. Hard times and the large amount of labor required to complete the laboratory apparatus are the two main causes of the failure to report actual results of tests.

Railroad men are well satisfied with the report on safety chains for freight cars, and accept as practically final the decision that "the committee does not recommend the general use of safety chains on any classes of cars."

Really useful progress has been made during the past year in the matter of bringing railroad publications to the standard sizes. All of the railroad clubs have adopted these sizes and two makers of railroad car furniture have designed cabinets to hold standard size pamphlets. It has been requested that all supply firms mark their circulars and pamphlets with the standard size in one of the upper corners of the outer page or cover to assist in filing and in maintaining the sizes uniform.

The Rules of Interchange have been modified considerably and in this matter the good work done at the several railroad clubs shows up in such a marked way that the superior officers of railroads can see the advantage of encouraging their mechanical men to attend the meetings, take part in the discussions, and, what is equally important, help to give to the monthly meetings an increased dignity and importance, and, possibly, something of a semi-official character. There is much more time to discuss the rules in detail at the railroad clubs than at the annual meetings, and better results are obtained if this is done. It is noticeable that the changes in the rules each year reduce the work of inspectors at interchange points and decrease the delays to freight in transit. The air-brake defect card presented by the committee on air-brake and hand-brake apparatus on cars, as proposed by the Western Railway Club, is an example of the useful results of work in the railroad clubs.

One important fact about the hanging of brake beams should be noticed here; it is the apparent inclination of the mechanical departments of railroads to grant the requests of the car men and inspectors for brake beams hung outside of the wheels and to the car bodies. This is not specifically and definitely recommended in the reports, but the expressed opinions of many of those in attendance this year is in favor of such location as a measure of economy and safety. The cost is less and the inspection more certain.

The report on heating passenger equipment consists of statistics as to the equipment in use, but nothing whatever is said about the punishment that should be meted out to some Western roads that still use cord wood; neither is there a recommendation as to the most advisable construction, or location of pipes.

Altogether this convention was an interesting and useful one as the reports of the committees and the discussion thereon will show. The attendance was good and the exhibits quite equal to the average of the past five years.

Pressed Steel and Diamond Freight Trucks.

An English engineer writing on another page concerning the American diamond truck, pressed steel truck and a truck with pipe braces which he offers as an American standard, gives us what the reporters call "food for thought." We cannot take the space to comment on his statements and reasoning in great detail, but will point out a few of the more important errors into which we conceive that he has fallen.

He says that it is a well-known fact that a large proportion of the so-called unexplained derailments are directly attributable to brake beams falling down, and that it is admitted that the system of so hanging beams that they are acted upon after they are applied to the wheels by the motion of the bearing springs is wrong in principle and practice.

Who is in possession of the well-known facts as to the cause of a large proportion of the unexplained derailments? We should like mightily to get these facts and to have permission to publish them. The factor of safety in hanging brake beams is so great that there must be gross carelessness in inspection when they drop on the track. There are many parts liable to cause derailments in which this factor is lower and inspection more difficult. It is no new idea to assign the majority of unexplained derailments to some particular feature; sometimes it is the wheels that are at fault, sometimes the axles, sometimes M. C. B. couplers pulling out, or it may be broken spring planks, splice bars, or sheared off spikes. The "cause of the unexplained accidents" is a wonderfully handy thing for the man who has a specialty to sell.

The fact is that some of our most important railroad lines are returning to the practice of hanging brake beams above the springs, and the report of the Committee on Brake Beams presented at the M. C. B. Convention this week will show that many car are now built with the modern metal brake beams hung above the springs. We do not say that this is the best practice but simply that there is no universal opinion against it and that there is a tendency toward it, and that results of service seem to show greater durability when this hanging is used.

The English engineer finds that the brakes being applied when the axle box is in one position, the first low joint or inequality in the rails will cause a shifting of the axle box and brake shoe, and the brake is useless until applied again. But if air brakes are used the elasticity of the air will take up the slack caused by any such readjustment of shoes on the wheels. If hand brakes are used the spring of the levers and beams and the twisting of the long brake staff will furnish the necessary spring slack, if the shoes are put in the horizontal plane passing through the axles, as they generally are. Taking an extreme instance, if a rail joint is one inch low and the brake shoe is in this horizontal plane, the horizontal movement of the brake shoe, due to one inch vertical movement of the wheel, would be less than one-sixteenth of an inch. Further, if a shoe rises or falls on the wheel passing a low joint or a high one, it does not stay in the new position but returns nearly to its normal place when the high or low spot is passed.

The English writer thinks that it is unfortunate to be handicapped by the unwillingness of railroad officials to publish in the Association Reports drawings of representative types of their best practice. Such drawings are not published in the M. C. B. Reports because there is no reason for putting them there. Any railroad man or reputable mechanical engineer can get a full set of detailed blue-prints of almost any railroad's standard truck by asking for them. The English student can find such drawings in great detail in the files of the *Railroad Gazette*, which are available to him in many public and private libraries in his own country.

Of course it is unnecessary to say to our American readers that the English engineer is in grievous error in taking the Harvey truck as an example of American standard practice.

As the truck shown with the pipe braces is offered as a candidate for the position of "standard American diamond truck," and as criticism is invited, we will begin the criticism with a few suggestions. It is claimed that the bolster being formed of two eye-beams, has a section sufficiently shallow to bring the strain of the centre plate and king pin well within their ability to resist lateral shocks. We confess that we do not understand what this means in the analysis of a freight car truck, nor is the purpose of the shallow bolster yet clear.

The springs are located on the centre lines of the side frames and a spring plank, although used, is unnecessary, especially as the spring plank is free to slide vertically. The Schaffer truck of St. Louis is an example of a better construction and has no spring plank. This may be seen in the *Railroad Gazette* April 14, 1893.

The gas pipe thimble braces would probably condemn this new truck with most American railroad men from the outset. This is one detail of which Americans are rather tired, for they quickly get loose owing to the small end bearing.

It is claimed that the columns of this truck are made to help each other to resist shocks and keep the frame square. But do they do this when the spring plank is free to "slide vertically"? American diamond trucks have the columns attached to each other in the same way as in this truck and this feature is not novel.

It is claimed that there are few fastenings exposed to direct shearing strains, nearly every bolt has tension alone to resist. If this were true, so much the worse for the truck; but it is not correct. The following parts and some others are in direct shear: Bottom and top bars, box bolts, centre plate rivets, column bolts, and practically all the parts that are in direct shear in the American truck. It is always better to put a bolt in shear than in tension. This is generally true of all parts of a truck and indeed is elementary.

The Fox pressed steel truck hardly requires defense for it is used in Sweden, Germany, India, England, Mexico and the United States, and a great number have been built. They have given general satisfaction so far as we can learn. There have been defective parts, due to the difficulty of getting the quality of material needed for light work at a reasonable price. The trucks built in this country have been good with the exception of a few built at first from bad stock. The pressed steel truck is made with, as well as without, sliding boxes in the jaws; an important fact which the English engineer neglects to mention. But why has the sliding box which he criticizes been adopted by the Indian state engineers, the Swedish government engineers, the London & North Western Railway, and a board of railroad men in the United States who were called in by the Fox company to select a design? Simply because it is the best arrangement to give freedom of motion and to reduce the weight, cost, and number of parts. Its advantages are many and the wearing of the jaws complained of by the engineer is very small, as English practice with sliding jaws should teach. In freight service the life mileage of cars is so small that much wearing surface is unnecessary.

The objection to the special nature of pressed steel trucks as giving trouble in repairs, applies with like force to other trucks and will not be removed until we have a truck that experience has selected as a safe standard. Until that time it is well to encourage improved specialties.

The English engineer says "in the pressed frame you have two cross channels butting end on to the side frames, held only by knees formed of their ends through which pass a rivet or two. When new there may be only the usual play of the journal in the brass, but when the axle box and its guides wear and the collar and shoulder of the axle wear the brass, the result of running over frogs and switches, and around curves, soon puts an end to the life of your rivet, and your truck has simply to drop off the track to get out of shape." Now, in fact the "cross channels" are held by substantial knees, for lateral strains, and by wide and strong gussets which the writer does not mention. They are held not only by a rivet or two but 44 rivets, 11 to each end of each truck channel. But how does the end wear of the brasses affect the strain on the rivet, and will any truck stay in shape if it drops off the track?

We will take up only one other of the criticisms of the English engineer. That is what he has to say about flanged steel, which would perhaps not be so remarkable if we were not using flanged steel as freely as we use unflanged steel, in all important work. In gun carriages, steam boilers, ships and dredging machines pressed steel flanges are so common as to need no defense, and this is true in many fields of mechanical engineering.

The writer says that his frame has all of its strains in line of greatest strength, and the whole forms a striking commentary on the uselessness of torturing plates into goose necks to provide means to keep a truck from bobbing up and down in the horn plates wearing itself out. He also asks what we may expect for the life of a structure whose existence depends upon a transverse section of metal *mashed* into right angle form, weakest where it should be strongest. His claim of a reduction of area of 15 to 40 per cent. at the root of a flange in pressed steel is not warranted by experience

here, and is not true of the work done by the Fox Pressed Steel Company, the Schoen Manufacturing Company, the Pennsylvania Railroad, the Pittsburgh Locomotive Works, the Continental Iron Works, or many other makers whom we might name. When the dies are reasonably well made, the corners have practically full thickness.

We are asked "what is the result of the use of a section of metal without elasticity as a bearing beam for carrying the centre plate?" But where is such a section used? Certainly not in the pressed steel transoms of the Fox truck, which are plain channels with round roots and tapering width of flanges, and having the characteristics of rolled channels, but which are made of a better grade of material. The material has been well worked and has been proved by the process of pressing to be free from local defects. The gain from the tapering flanges of these transoms more than offsets the greater theoretical strength of the square root of the rolled channel and the pressed shape is stronger for equal weight of transom. The fitting of the pressed section into the sides is as good where the rivets are as good boiler work, and that is good enough for it is not the "fit" that holds but the bringing the parts together where the rivets are. To machine the ends of pressed transoms is not compulsory as in the case of rolled channels, and that is a gain for the cost is less, and machining does not add to the strength. The rivets and bolts must hold the joints.

The writer wants the comparative weights of the pressed steel parts and those of the diamond truck which they replace. These have been given before. They are about 2,200 lbs. a car, for pressed steel, and 3,400 to 4,200 lbs. for the diamond truck, a difference of from 1,200 to 2,000 lbs. a car.

Finally, pressed steel for boilers, cars, trucks, dredges, mining machinery, ships and many other uses, has made rapid progress in recent years in the United States. It has come to be a good servant for the designer and we question very much if in truck construction there will ever be a serious return here towards a multitude of assembled commercial shapes built up into a structure that has so many joints and special parts that proper inspection is impossible.

The floods in the extreme Northwest are even worse than appeared a week ago, but it is still impossible to give any accurate statement of the damage. While the destruction of homes and farms, and the loss of life seems to have been worst in British Columbia, the damage to railroad structures was worst on the line of the Union Pacific between Portland, Or., and Umatilla, 186 miles. The damage here is so great that conservative railroad men estimate the total loss at $1,000,000 or more. The estimates made by the officers of the road, while more guarded, do not contradict this. At last accounts the water was still very high, and it was likely that railroad traffic could not be resumed for several weeks. In the straitened financial condition of the Oregon Railway & Navigation Co., which constitutes this part of the Union Pacific system, this loss may complicate the movement for a separate receivership for the Oregon lines. At The Dalles, the locomotives of the Union Pacific were placed on the highest ground possible, but they were completely submerged, so that only the smokestacks were visible. The officers of the road estimated that at least 100 miles of their track in Oregon was under water on June 7. All of the embankments along the Columbia River were washed away, as well as most of the bridges, and the ballast is doubtless very much damaged throughout the flooded district. The Union Pacific also suffered serious damage in Idaho. Between Lane and Anderson the track was submerged for five miles, and many bridge approaches were washed out. The Canadian Pacific lost no important bridge, and many of the washouts which figured in the press despatches were small and have already been repaired. At Golden, however, there was a washout 1,000 feet long where the bed of the Kicking Horse River had been diverted when the road was built. At Thompson Siding, on the Pacific Division, there was a landslide so large that a new track had to be built around it. Near Kamloops, two small bridges were carried away, and 1,000 feet of track destroyed. There were many washouts for a distance of 90 miles. The trouble here was not from long rains but a so-called "cloud-burst" in the mountains at Lytton. Thousands of tons of rocks, trees, mud and earth were piled on the track. This storm did in five minutes as much damage to the tracks as the floods took two weeks to do. Through passengers, including an excursion party bound for Alaska, had to be kept for a week or two at the Canadian Pacific hotels in the Rocky Mountains.

The Receiver of the Central of Georgia, recently decided to have his freight enginemen run through from Macon to Savannah, 191 miles, instead of turning at Wadley, 84 miles from Macon, and he asked the court to approve the order, but Judge Speer declines to do so, and comes out with a lecture on the "Philosophy of Our System of Government for the Advancement of the Working Classes," which delights the labor leaders and furnishes copy for the reporters. Judge Speer says:

"The policy of our law intends that the American laborer shall make more, and he deserves more. We intend that he shall have more money to spend; we intend that he shall have more time to read; we intend that he shall have more opportunities to think, to be with his family, and to provide for their welfare."

This is all very fine, provided the law can do what it "intends." But, as often as otherwise, lengthening runs has led to easier work for the men, and increased monthly earnings, so that the bearing of this economic lecture on the present question does not very clearly appear.

We recently referred to the importance of using correct and precise language in train rules, and to the fact that the presence now of such language in most of the rule books of American railroads was due chiefly to the thorough and careful work done by the Train Rule Committee of the Time convention in 1885-87. It is a question whether the work of laying down principles can be separated from the preparation of the rules (as was virtually decided upon at the April meeting) in any satisfactory way. As almost every rule affecting the movement of trains has within it possibilities of disaster to life and property if misconstrued, we encounter a "principle" at every sentence, in many cases. It is true that a paragraph might be printed, from two to ten times as long as the rule, telling the individual manager how to make a certain rule for himself, but if the thought of the man or committee laying down the principle can be just as well and better set forth by the rule itself, why not do it in that way? Moreover, the railroads need help from a wise and careful committee in phrasing their rules as much as they need it in deciding upon principles. The chaotic condition of things previous to 1887 was due in large measure to the fact that rules were written by men unskillful in the use of words. The same danger exists now. In a far less degree, of course, but yet if 500 managers were to sit down to write a rule in accordance with a principle laid before them by the American Railway Association, what proportion of the 500 would phrase it in just the best way? (We are assuming the case of a rule applicable alike on all roads). It is true that much of this clarification of language was done in 1886, once for all, and that anyone now using a slovenly rule where the Standard Code has shown him how to make a good one, is exceedingly careless; but who has not seen specimens of just this thing? Scores of managers have deemed it advisable to vary the standard rules here and there, and everybody will recall having seen such changes in which excellences of the Standard Code have been carelessly thrown away. It is well to remember that all our literary monuments, which are our standard of perfection in language, were the work of geniuses, of which the railroad world has not a great many; and that *all* good railroad codes have come from hard working committees, not from any one or few individuals. Is there any exception?

This subject has been brought to mind by the receipt from a friend in New South Wales, of a copy of the train rules of the government lines of that colony, as adopted by the Railway Commissioners in 1891. The practice in that country is very much like the English, and the rules sound very much like those of the British Clearing House; but they are, so far as we are able to judge from a superficial examination, decidedly superior to the English code. This difference significantly illustrates the point we have often drawn attention to, that rules for such intricate operations as those involved in handling trains will bear a prodigious amount of polishing. The committee of railroad men that can draft a code free from glaring defects is rare; such a committee on any one road is very much rarer, and the individual superintendent who can do it (and who is sufficiently free from other burdens so that he actually will do it) is almost or quite unheard of. The excellence of the New South Wales book is probably due to three principal sources: 1, it is prepared by men who have ample experience of their own to guide them; 2, they availed themselves of the experience in rule-making of the oldest and most thoroughly disciplined railroads in the world, and, 3, the book is evidently edited by some one to whom accuracy in the use of language is a natural and not an acquired art. A sample of the results of patient corrections, time after time, until the rule is just right, may be found in Rule 50 of the book we are speaking of.* The need of the explanatory clause is at once apparent if one stops to think, but we do not recollect ever seeing it in an American code. We observe, however, that the lamp hand-motions in New South Wales are not consistent with the daylight hand-motions. The rules also prescribe green for caution and white for "all right" in hand signals, but green for "all right" and white as a danger signal, in fixed semaphore lights. Thus, apparently, this inconsistent practice has been going on for three years at least, without any very serious consequences. We do not mention this for the purpose of commending inconsistency in signals, but it may perhaps be taken as a hint that possibly we Americans can hesitate too long over difficulties which are not so bad in practice as they seem to be in the preliminary discussion.

* 50. "In shunting operations by night, a white light waved slowly up and down means "move forward;" i. e., go away from the person giving the signal; a white light waved slowly from side to side across the body means "move back;" i. e., come toward the person giving the signal."

Railroad construction does not make much progress in Australia of late years. It had been overdone, the mileage in proportion to population being more than in this country even, and the colonies not growing so rapidly. They had good credit in England, and could borrow money at low rates of interest, which has induced them to build in advance of their necessities, hoping to make available and create a demand for the vast areas of government land which are now lying waste, or are used only for grazing. This is similar to the course of railroad construction in this country from time to time, though in Australia the colonial governments build most of the railroads, and get a large part of the advantage from the rise in the value of the land, which is not given away there, but sold at, we believe, a pound per acre. At the close of 1892, there were 9,254 miles of government rail road in Australia, besides 475 on the adjacent island of Tasmania, and 1,879 in the more distant New Zealand. They have not been costly, averaging in Australia $52,270 per mile. But their traffic is light, and their average earnings per mile in 1892 were but $4,424 gross, and $1,565 net, the latter being just about 3 per cent. on their cost. The net earnings were 3.58 per cent. on the investment in New South Wales, 2.63 in Victoria, 2.51 in Queensland, 3.49 in South Australia, and 0.38 in West Australia, which latter has but 203 miles of State railroad and very few inhabitants. In New Zealand, which promises eventually to support a large population, not having the vast dry interior which is likely to restrict half of Australia to grazing, the return was 3.05 per cent. on the investment. It is one of the newer colonies, and has been going too fast. Besides these government railroads there are 598 miles of private railroads in Australia (453 in the very new colony of West Australia), and 150 in New Zealand. In New South Wales 198 miles and in Victoria 60 miles of State railroad were opened in 1893. In West Australia a State railroad 164 miles long, extending to the recently discovered Yilgarn gold field, was to be opened last April. The 5 ft. 3 in. gage prevails in Victoria, 4 ft. 8½ in. in New South Wales, and 3 ft. 6 in. in Queensland, West Australia and New Zealand, while in Tasmania and South Australia there are lines of both 5 ft. 3 in. and 3 ft. 6 in. gage.

The business men of Philadelphia still keep up their agitation for improvement in the facilities and conditions which they think ought to promote the foreign commerce of the city, but their quest seems to continue rather discouraging. A Committee of the Commercial Exchange has lately made a report which shows that the decline in the export grain trade is not all to be laid to the selfish railroads, as most of the previous statements on the subject had made it appear. This committee says:

The grain from the Atlantic seaboard has recently very largely been sold in parcels of 8,000 bushels, or a multiple thereof, and carried by line steamers, and since this method of selling and shipping grain is growing in favor and in custom, Philadelphia cannot expect to do her share of the business unless the steamship service here shall be largely increased, not only by more frequent sailings to the ports now reached by the lines operating here, but that this market should have an opportunity to widen by the establishment of lines to the many new foreign markets. . . . The steamers sailing from here should encourage the grain business by setting apart some room on each and every sailing at a rate of freight not exceeding the rates current in New York or Baltimore, so that this market would be regularly recognized and depended upon the same as others.

It is held that the railroads ought to render assistance in getting steamers to offer better facilities, but we do not find any suggestion as to *how* they can do this. The steamships are also chided for not competing with one another sharply enough. But the members of the committee seem to realize that they have a difficult task on their hands, and they wind up the report with a recommendation that the one cent differential on grain from the West, in favor of Baltimore, be abolished. On the other hand, the differential of two cents in favor of Philadelphia, as against New York, should *not* be abolished, for "the causes for this still exist." The main grievance against the railroads seems to be that New York is favored with two or three "weak" roads which take freight through to the West at lower rates than any road is willing to accept at Philadelphia, and whose influence in keeping down freight rates is felt in eastbound business also, though eastbound rates are nominally no lower than to Philadelphia. In other words, the great need of Philadelphia is a weak road; one to which so little business goes naturally that it will reduce freight rates below the normal basis.

On the Belgian State Railroads, some of which are leased for a share of the earnings, the principle obtains that when there are two routes between two stations, the passenger rate is determined by the shorter route, and to it are credited all the passenger earnings between those stations, though the passenger is free to take the other route, which may be the quicker. Between Brussels and Lille one line worked by the State belongs to it, while parts of another, which is longer, belongs to a company to which the State pays a share of the earnings as rental. The principal towns are on the longer route, and the express trains were run over it, making better time than on the short route, so that the bulk of the travel has gone by the longer route. But the earnings from this travel were credited to the short line, so that no part of them went to the lessor company over whose road the travel actually passed. This company sued the State for its proportion of the earnings, and recovered in

the lower court. But pending appeal the State transferred the express trains to the short route which it owns. By this not only was the Brussels-Lille travel attracted from the long to the short route, but also a great deal of other travel, a part of the earnings from which has always gone to the lessor company. This change brought the company to repentance; it withdrew its complaint, the express trains were put back on its line, and it recognized the principle of the earnings to the shortest line. Cases similar to this in principle are continually coming up. A traffic which can be carried by either one of two (or more) lines may be carried to greater aggregate advantage by one; but if the lines have different owners, the owner of the one which does not do the work may rightfully claim a share of the profit for the work which he might do but does not do. He permits the other to do the work for the common advantage, and if he does not get a share of the advantage he is not justified in abandoning the business.

The City of Chicago, through its corporation counsel, has filed suits aggregating over $2,000,000 against the various railroads entering the city to recover for damages which the city has paid on account of changes in grade due to the construction of bridges at city street crossings. Owners of property which adjoins 13 viaducts have obtained damages from the city at various times to the total amount of $545,144. Nearly every railroad entering the city has been included in the suits, but the roads entering from the West are the most affected. The city officials say that the suits are brought in good faith, and will be pushed as rapidly as possible. Officials of the railroads say that the suits are sensational, and it is explained that many of the viaducts were built by the special requirement of the city. At first the city paid the damages, and a part of the cost of approaches, later it paid only the damages, and now an attempt is to be made to compel the railroads to pay these. The present administration of the city government seems to be particularly anxious to regulate the railroads. An ordinance passed recently requires elevated railroads to maintain a light under the structure at each street crossing, and the reason for non-compliance with the same by the "Alley" elevated road was the subject of a conference last week between attorneys for the city and the railroad. The railroad pleaded poverty, but was given to understand that the terms of the ordinance must be obeyed. The matter was left in suspense till it could be brought before the Board of Directors of the railroad.

A new schedule of passenger fares has been adopted in Russia, notably for the enormous reductions in rates made for great distances. For the third-class rates are unchanged for distances of 106 miles or less, but with the two higher classes the reductions begin with 25 verst (16½ miles) journeys. The rate of reduction increases with the distance, and for 1,800 versts (1,200 miles) the third-class fare is 53 per cent., the first-class 55 per cent. and the second class 64 per cent. lower than the old rates, being $15 first-class, $9 second, and $6 third, which cannot be called dear for a journey longer than from New York to St. Louis. For 300 versts (200 miles), the fares are to be $4.45, $2.67 and $1.78 for the three classes respectively; for 600 versts (400 miles), $7.33, $4.40 and $2.93; for 600 miles, $9.70, $5.82 and $3.88; for 800, $11.95, $7.02 and $4.68; for 1.400 versts (933 miles), or about the New York-Chicago distance, $12.95, $7.77 and $5.18. The chief argument given for the change is that there has been very little long-distance travel in Russia, especially in the lower classes; and what may be called out by the reductions will be chiefly fare gain, which is probable enough, and was true in Hungary, where, however, there are no such long distances, and greater reductions were made for short distances. The new Russian rates, should there be no increase in travel, would reduce earnings $3,500,000 to $4,000,000, or about $200 per mile.

The renewal of the 108-lever interlocking machine at the Grand Central Station, New York city, was accomplished by the workmen of the Johnson Railroad Signal Company, in 24½ hours, which is believed to be the fastest time ever made in the erection of so large a machine. The removal of the old machine was begun at 11 p. m., on Saturday, and the erection of the new one was begun at about 5 o'clock the next morning. At 11.30 that night not only the levers but all the locks were in working order. A few temporary levers had been erected on the ground, so that there was no delay whatever to trains.

Railroad Matters in Chicago.

Freight Traffic.—There is little improvement to report in any class of freight traffic. The grain movement from the country continues moderate, the deliveries at Chicago the past week by the eleven Granger roads aggregated 2,678,000 bushels. The unsatisfactory prices and continued uneasiness regarding the growing crops were the chief causes of the moderate deliveries. The only important class of traffic that showed an increase was live stock, on which there was considerable gain. Coal traffic has been virtually suspended on nearly all the leading roads. But greatly as the roads suffered from the direct loss of coal, the loss by interruption of business has been much greater. In this respect no road has been exempt.

The movement of freight to the country continues to decrease. The mining and other labor troubles have almost paralyzed all the leading industries throughout the country, on account of a lack of fuel; the complaints in this respect are now more serious than at any time since the strike commenced. Chicago dealers in iron and other materials state that new orders have entirely ceased, and that many already booked have been countermanded. The roads traversing the iron mining districts in Minnesota, Wisconsin and Northern Michigan, are having a fair ore traffic, but many of the large smelting furnaces will soon be compelled to close for want of fuel..

The deliveries of grain (bushels) at Chicago, by the leading Western railroads for the week ending June 9 and the corresponding time the two preceding years compare as follows:

	1894. Grain.	1893. Grain.	1892. Grain.
C. & N. W	595,000	995,000	314,000
Ill. Cent	493,000	745,000	386,000
C. R. I. & P.	277,000	16,000	442,000
C. B. & Q.	525,000	1.356,000	573,000
C. & Alton	96,000	212,000	71,000
C. & E. Ill.	34,000	72,000	29,000
C. M. & St. P	371,000	575,000	692,000
Wabash	109,000	168,000	118,000
C. & Grt. W.	86,000	252,000	118,000
A. T. & S. Fe.	87,000	325,000	288,000
L. N. A. & C	5,000	...	...
Total bush.	2,678,000	4,716,000	3,031,000

The number of car loads of grain received at Chicago by the leading Western railroads for the month of May and for the corresponding time the two preceding years compare as follows:

	1894.	1893.	1892.
A. T. & S. Fe.	700	1,126	1,825
C. & Alton	757	916	933
C. B. & Q.	3,003	5,886	3,710
C. & E. Ill.	137	329	254
C. M. & St. P.	2,297	3,629	1,690
C. & N. West	2,608	2,822	1,790
C. R. I. & P.	1,749	2,386	1,724
C. & Grt. W	388	761	1,001
Ill. Cent	1,782	3,199	2,095
Wabash	634	866	614
Wis. Cent.	428	10	12
Other roads.	1,700	2,248	2,202
Total cars	16,183	24,084	17,850

The following shows the deliveries of flour (barrels), at Chicago by the leading Western railroads for the week ending June 9 and the corresponding time the two preceding years:

	1894. Flour.	1893. Flour.	1892. Flour.
C. & N. W	9,600	11,975	16,705
Ill. Cent	1,500	590	...
C. R. I. & P.	10,700	7,700	3,625
C. B. & Q.	5,893	11,091	13,124
C. & Alton	6,900	300	3,750
C. & E. Ill.	600	300	125
C. M. & St. P.	12,900	19,025	14,775
Wabash	1,215	600	2,700
C. & Grt. W	8,506	7,845	38,631
A. T. & S. Fe	...	...	420
L. N. A. & C.	...	...	...
Total bbls.	57,814	59,426	93,855

The shipments of live stock from Chicago by the east bound railroads for the month of May for the past four years compare as follows (cars):

	1894.	1893.	1892.	1891.
B. & Ohio	308	455	499	451
C. & Erie	647	165	331	500
C. & C. Term.	1,382	1,089	977	776
L. S. & M. S.	2,300	1,976	2,032	1,546
Mich. Cent	532	695	919	911
N. Y. C. & St. L.	314	375	1,487	1,523
P. C. C. & St. L.	46	128	192	113
P. Ft. W. & C.	1,216	961	1,088	1,104
Total.	6,745	5,844	7,525	6,924

Passenger Traffic.—There was a small increase in passenger traffic the past week. The gains were mainly on interior and local travel, and Chicago suburban business. Farmers having made good progress with their spring work are paying a little more attention to other business, and people who do business in the city, but through the summer live in the country, have gone there with their families. There are some indications of an improved excursion business to summer resorts. The tendency to restrict train service because of the scarcity of fuel is more pronounced. Surprise has been expressed that the Illinois Central, which traverses as great length of coal territory as any other line in Illinois, and handles a large percentage of coal from two or three mines that have been steady producers, should withdraw more trains than any other road; but the officials state that prudence justifies their action. Their supply of fuel has shrunk severely, and their stock is now very low. The threats of the American Railway Union to refuse to handle Pullman sleepers cause little concern among railroad officers. As a railroad official expresses it: "We are not at present in a mood to be dictated to by employees, especially where the latter have no personal cause for complaint." It looks, however, as though the Pullman strike was near its end, as the driblets obtained by persistent begging do not go far toward feeding the idle men.

Track Elevation.—The long pending negotiations between the City and the Chicago, Rock Island & Pacific, and Lake Shore & Michigan Southern railroads regarding the elevation of the tracks of those roads within the city limits, has been practically settled. The city accepts $100,000 from the roads, and releases them from all damages to abutting property that may be assessed against the roads for track elevation between Sixteenth and Twenty-second streets. As the city has already agreed to absolve the roads from damages south of the latter street, the only cost to them will be for track elevation. An official of the Rock Island stated that all the plans of their engineers for the elevation and depression of the tracks had been practically accepted by the city. The consent of these roads to elevate their tracks will have no bearing on the other lines less fortunately situated. The location of these latter through the city renders track elevation impracticable, and if attempted it would be strongly opposed by a large class of property owners. The unfriendly spirit shown by the City Council toward the railroads is inducing them to make improvements outside of the city whenever possible. Grain elevators are going to South Chicago, two large structures being already completed there, and others are in course of construction. The location of the elevators does not incommode the railroads, as trackage and yard room is abundant, but it largely incommodes Chicago grain dealers, and Chicago aldermen are likely to learn ere long that instead of injuring the railroads they are building up other places.

Chicago, June 11.

The Coal Miners' Strike.

The worst of the coal strike has continued to be in Ohio, Pennsylvania and Illinois, where violence has been reported every day, but an agreement as to wages was reached at a conference in Columbus, O., on Monday, and peace is probably at hand, though the arrest and punishment of large numbers of lawbreakers, which the authorities must at once attend to, may make trouble for some time yet, and the miners are reluctant to act on the decision of their leaders at Columbus. In Ohio many hundred troops were called out to preserve order, but even this large number was unable to guard the numerous places where strikers tried to interfere with coal traffic.

On June 7, the engineman of a Vandalia coal train was killed in his cab near Knightsville, Ind., by a stone thrown by strikers. On that day all traffic on the main line of the Baltimore & Ohio from Bellaire to Newark, O., was completely stopped for 20 hours, strikers holding coal trains on the main track. Injunctions were issued, but business was finally resumed only by sending soldiers with every train. Attempts were made to burn a Baltmore & Ohio bridge at Barnesville, but they did not succeed. Near Ironton, O., on June 6, track watchmen were knocked down and overpowered.

The West Virginia mines continue at work and they ship large quantities of coal. All the railroads carrying this coal through Ohio have been attacked by strikers. At Cambridge, a passenger train was stoned by miners who were enraged because a coal train had been run ahead of the passenger on the same schedule. A bridge of the Cleveland, Lorain & Wheeling at Bridgeport was burned June 7, but not so badly but that the road was made passable the next day. At Salineville, O., on the Cleveland & Pittsburgh, June 8, miners stopped a coal train by soaping the track and then threw the contents of the cars (coal) onto the ground. They wrecked another train by misplacing a switch. Obstructions were placed on the track of the Chesapeake & Ohio near Montgomery, W. Va., on June 7, at three places, just ahead of a passenger train. The Governor of West Virginia ordered out 11 companies of militia to protect the Baltimore & Ohio near Wheeling. On Sunday a bridge of the Cleveland, Lorain & Wheeling was burned near Midvale, the watchman being overpowered. On Monday, another one was burned, which could not be replaced in less than four days. The same day there were three attempts to wreck trains near Barnesville, O., and a small trestle of the Wheeling & Lake Erie at East Greenville was blown up. Similar acts of violence were reported from Navarre, on the Cleveland, Canton & Southern, and other places.

A bridge of the Louisville & Nashville in Alabama was burned on Sunday, An important iron bridge of the Kansas City, Memphis and Birmingham at Carbon Hill, Ala., was blown up with dynamite on Monday, and three spans of a wooden bridge of the Georgia Pacific at Cardiff were burned on Tuesday by a mob which overpowered the watchman. Five other bridges in that region have been burned within a few days and the striking miners are believed to be responsible for all of the outrages. A Burlington freight train was "held up" by 150 miners at Milton, Mo.

In spite of all difficulties a good deal of West Virginia coal has been sent to Ohio and the West, and the railroads seem to have kept all important trains running. The reports of trains taken off, of which there have been many, do not state what trains, but it is safe to say that all thus far suspended have been light or unprofitable or both. The Erie is using a good deal of anthracite as far West as Marion, O. The Lake Shore & Michigan Southern has borrowed hard coal engines from the New York Central. The New York & New England has bought some bituminous from Nova Scotia, and is using some anthracite.

The St. Louis Southwestern is burning wood, and a wood-chopping machine has been built at the Tyler shops which cuts up 50 cords a day. Many roads are using old sleepers wherever it is possible to use them. Factories have shut down by scores for lack of fuel, but some of them will doubtless succeed in soon resuming either wholly or partially. The reports do not indicate to what extent this is true. The anthracite dealers are happy in the belief that some manufacturers now using small hard coal for the first time will continue to use it.

TECHNICAL.

Manufacturing and Business.

The Missouri Frog & Crossing Works, of Kansas City, Mo., have been incorporated by John H. Lucas, James H. Frost, William H. Lucas and C. H. Fitzhugh.

The Tennessee Construction Co., of Chicago, has been incorporated to build and equip railroads. The incorporators are C. M. Walker, C. M. Sherman and C. M. Stumcke.

The Toledo Bridge Co. is working a full force of hands, and has enough orders ahead to keep the plant working steadily for three months. New machinery is in operation and works satisfactorily.

The Directors of the Dominion Bridge Co. held a meeting at Montreal last week preparatory to the annual meeting. The report of the year's work was satisfactory and it was decided to pay an annual dividend of 5 per cent.

The Springfield Malleable Iron Co., of Springfield, O., has made arrangements for the manufacture of the Miner draft rigging, which was described and illustrated in the *Railroad Gazette* of June 16, 1893. The draft rigging is giving very good satisfaction on the Hutchins Refrigerator cars, and is receiving the attention of other companies.

The Page Woven Wire Fence Co., of Adrian, Mich., report recent orders for the Page fence from the Toledo & Ohio Central and the New York, Chicago & St. Louis roads, and the Central of Pennsylvania. The list of roads using the Page fence includes the Canadian Pacific, the Delaware & Hudson, the Michigan Central and many other important lines.

Manning, Maxwell & Moore, of New York, have just received an order from the Frank Kneeland Machine Co., of Pittsburg, for one of their large three-motor electric traveling cranes with an auxiliary hoist, which makes the second crane sold by the firm to this well-known concern. A large number of inquiries for the cranes are being received by the firm which reports this department as being very busy.

The Philadelphia & Reading Railroad bridge at Muncy, Pa., was carried away during the recent flood, the Susquehanna River rising 25 feet. Mr. J. E. Robinson, of 1,301 Market street, Philadelphia, who has had a large experience in making borings for foundations for heavy buildings, wharves and bridges, was engaged to conduct the soundings for new piers for the bridge, and this work is now nearly completed. The soundings were made in 15 feet of water, while the river, on account of the floods, was a torrent.

Valentine & Co., manufacturers of railroad varnishes and colors, have issued a neat souvenir to be distributed at the Master Car Builders' Convention at Saratoga. It is a pocket memorandum book having a celluloid cover, on one side of which is the company's trade-mark and address, and on the reverse a reproduction of a Pullman vestibule car. It is also stated that 83 per cent. of cars shown at the World's Fair, Chicago, were finished with Valentine varnishes. This souvenir, we are informed, will be distributed to every one attending the Master Car Builders' Convention.

The United States Headlight Co. was organized last January to bring about the consolidation of the various firms engaged in the manufacture of headlights in this country. It is now announced that the company has purchased from M. M. Buck & Co., the Dayton Manufacturing Co., Kelly Lamp Co., Steam Gauge and Lantern Co., I. A. Williams & Co., and the Adams & Westlake Co., the machinery, tools, patterns, etc., constituting their headlight business, together with 32 patents covering improvements in headlights. The United States Headlight Co. will have its factory and principal office at Utica, N. Y., with numerous branch offices. All the important manufacturers of headlights, it will be seen, have been brought into the consolidated company, which begins business with great advantages. It acquires excellent facilities for the manufacture of headlights, and secures the benefit of an experience of 40 years in such manufacture. It owns many valuable patents, and seems in every way prepared to withstand any competition that may be developed. J. Kirby, Jr., is the President of the company, and A. J. Williams is the Secretary.

New Stations and Shops.

The Canadian Pacific Railway Co. will build a passenger station at St. Hyacinthe, Que.

Transatlantic Freight Steamer.

The International Navigation Co., which owns the American Line, is having several freight steamers built in Scotland, and one of these, the "Kensington," has just made a successful trial trip on the Clyde. The vessel was built by J. & G. Thompson, of Clydebank, Scotland, the builders of the "New York" and "Paris." She is 480 ft. long, 57 ft. beam and 40 ft. deep, with gross tonnage of 10,500 tons, and a measured cargo capacity of 11,500 tons. The "Kensington" is fitted with quadruple expansion engines of 8,000 horse-power, and is expected to attain a working speed of 15 knots per hour. While primarily a cargo and steerage steamship, she will have accommodations for 200 cabin passengers.

The Sykes Patent Litigation.

It is known that both the Johnson Railroad Signal Company and the Union Switch & Signal Company have claimed to be the owners of the Sykes Block Signal patents. The Johnson Company filed a bill against the Union Company several years ago, and the Union Company filed a cross-bill, both claiming to be owners, and to enjoin the other from manufacturing or selling. In the lower, or trial court, the title of the Johnson Company was affirmed and it was held that the Union Company had neither title, nor even a license, and judgment went in favor of the Johnson Company on both bills, and on appeal to the United States Circuit Court of Appeals it has been decided that the court below was right in affirming the title of the Johnson Company, and in dismissing the cross-bill of the Union Company; but it also held that although the paper under which the Union Company had claimed title, or an exclusive license, did not give it such title or exclusive license, it did constitute a non-exclusive license, under which the Union Company could manufacture and sell upon payment of royalties to the Johnson Company. It also decides that the Union Company is liable to the Johnson Company for royalties due and unpaid, which may be collected in another action.

The Fontaine Railroad Crossing.

Since the illustrated article describing the Fontaine continuous railroad crossing appeared in the *Railroad Gazette*, June 19, 1891, some changes have been made in the device which simplify its construction and decrease the cost of repairs. The special feature of the arrangement is to provide a continuous rail in either direction at a grade crossing of railroads. As at first designed, the frame on which the frog rests was a built-up girder requiring much riveting. In the latest design the girder is an eye-beam and where bent to form loops at the corners for the post pockets, the inside flanges are cut away, leaving a channel shape. Sufficient bearing surface at the corners is provided by riveting plates to the flanges of the girder. The post, which is revolved so as to fill the space between the ends of the rails in the direction desired, is made in a solid piece, the upper end corresponding in shape to a railhead. The post rests on the plate which is riveted to the bottom flange of the girder. The posts are connected with each other and with the operating lever in the tower in such a manner as to give a continuous line of rail for the track that it is desired to use. Stops are provided to insure that the posts are not turned so far as not to conform to the line of rail, should a little lost motion occur in the connections, and a spring on the operating lever insures the posts being turned against the stops. The manufacturers of the crossing are the Fontaine Crossing & Electrical Co., of Detroit, Mich.

The Queen Empress.

This engine was built at the locomotive works of the London & North Western, at Crewe, early in 1893, from the designs of Mr. F. W. Webb, Chief Mechanical Engineer, and exhibited at the World's Fair, Chicago. It is sister engine to "Greater Britain," built at the same works in 1891, and which was put into service in October the same year, since which time, up to March 31, 1894, it has run a distance of 132,845 miles; and in one week, commencing Monday, April 17, 1893, and ending the following Saturday, ran 3,612 miles, working the fastest passenger and postal trains between Euston and Carlisle. "Queen Empress," on her completion in the shops, was not tried in steam, as is the usual practice, but was sent direct to the World's Fair, and it was not until after the close of the exhibition that she was run with her own steam for the first time at Chicago, whence, after a short trial on a siding about a mile long, she was started on her homeward journey, running to New York with a train of two English and three American cars, and during the entire journey ran perfectly cool and without any trouble whatever. Upon her return to Crewe she was overhauled and put into service on the 10th of February, 1894, and since that time up to the 30th of April following, had run 20,420 miles, working some of the fastest express passenger trains. The working of these two engines has been so satisfactory in their results that eight more of the same type are now in course of construction at Crewe. The reader will remember in general the type and dimensions of those engines. The boiler is made with an extra long barrel (18 ft. 6 in. in length) to allow of both the driving axles being placed in front of the fire-box. An intermediate combustion chamber is placed in the length of the barrel which divides the tubes into two lengths, those extending from the fire-box to the chamber being 5 ft. 10 in. long between tube plates, and those reaching from the chamber to the smoke-box 10 ft. 1 in. long between tube plates, the diameter outside in each case being 2½ in. The mean diameter of the barrel outside is 4 ft. 3 in. The combustion chamber has an opening at the bottom large enough to allow a man to enter, when necessary for repairs, and to this is attached a hopper fitted with a valve for the discharge of any ashes which may accumulate in the chamber. The valve is so weighted that in its normal position it is closed and air tight, but is connected by a rod to the footplate so that the driver may open it when required. This chamber is also fitted with a steam blast apparatus for cleaning the soot out of the tubes. The two high pressure cylinders are 15 in. diameter by 24 in. stroke, and the low pressure cylinder is 30 in. diameter by 24 in. stroke.

A Wooden Faced Brake Shoe.

Messrs. William Wharton, Jr., & Co., of Philadelphia, informs us that they are now putting on the market, after extended trials, a wooden faced brake shoe. It consists of a wooden block held in a suitable iron hanger, and it is claimed that it brakes better and wears the wheel less than a metal shoe, and that it is cheaper after the first cost. Renewal simply consists in putting the wooden block in the iron hanger, which latter has no appreciable wear. The labor cost of the change is small. It is claimed also that the durability of the blocks is greater than that of metal shoes. The block is made of oak, cut across the grain, exposing the ends of the fibres to wear. These shoes are in use on a number of street railroads, and the company has samples which have run 6,000 miles, with average stops, and on quite heavy grades. They have patterns for all standards and can fill orders promptly.

Another Jungfrau Railroad.

A project for a new Jungfrau railroad has been submitted to the authorities at Berne, Switzerland. The line is to begin at the upper end of the Wengernalp Railroad, at the station Scheidegg, and is to run to the summits of the Eiger and the Mönch, and by means of an elevator to the top of the Jungfrau. Electricity is to be the motive power, the current to be generated by water power, of which, it is estimated, something like 1,900 H. P. will be available.

THE SCRAP HEAP.

Notes.

There is a bill before Congress to regulate the prices to be charged by sleeping car companies, and a hearing is to be given upon it on June 26.

"Bill" Dalton, the famous train robber, was killed by United States officers near Ardmore, I. T., on June 8. It is said that the rewards offered for his capture aggregated $35,000.

The New York State Railroad Commissioners announce that the offer of a $50,000 prize by the Metropolitan Traction Co. for the best method of propulsion for street cars has been withdrawn.

Nineteen of the tramps who stole a Northern Pacific train at Arlee were sentenced to three months' imprisonment at Helena, Mont., June 9. Forty-five others were sentenced for 60 days on June 12.

The Superintendent of the Railway Mail Service has ordered that clerks on trains shall reside at some point on the route to which they are assigned. Those living off the lines must make the change before May 1, 1895.

General Superintendent Brown, of the Fall Brook Railway, has just paid the usual annual premium of $60 to each of 43 freight conductors for making a satisfactory record. Only four conductors failed to get the premium this year.

The crew of a freight train of the Philadelphia & Reading was attacked by six desperadoes in Philadelphia about 1 o'clock on Sunday morning last and a serious fight ensued, the highwaymen boarding the caboose and the engine while the train was moving. The train was not far from a police station and assistance was soon secured.

The business of robbing passenger trains, which has been rather quiet for several weeks, took a fresh start at Thompson Falls, Mont., on Sunday morning, June 3, where the day car in a passenger train, which was laid up on a side track on account of the floods, was "held up" by two men with revolvers, who secured about $200. The train stood not far from the station, and the sleeping car, which was locked, was not disturbed.

A minority report has been made to the House of Representatives on Judge Jenkins' action in issuing an injunction against Northern Pacific employees. It will be remembered that the majority of this Congressional Committee censured the judge. The minority, Messrs. Stone (of Pennsylvania), Ray (of New York), and Powers (of Vermont), make a much more intelligent report, calling attention to the clauses in the injunction which modified the apparently radical opinions in some parts of it, and recommending that Congress confine itself to its own functions.

Lake News.

Stocks of bituminous coal at the Lake Superior ports at the close of last week were about 375,000 tons, of which 125,000 were at Ashland, and the rest at Duluth and Superior. Of this the Northwestern Fuel Co. held about 100,000 tons. How closely sold up this coal was may be inferred by the fact that a company on whose docks were at least 60,000 tons, was unable to sell a single cargo to be shipped East. One cargo was actually bought, however, and shipped to Cleveland, it being the first time in the history of upper lake navigation that such a thing has been done. Almost all the local stocks are owned by the railroads and will be hauled away by them as fast as possible.

The great question on the lakes is that of fuel. Boats are tieing up for want of soft coal; others are burning anthracite, and others have secured modifications of their insurance policies which allow them to burn wood. Boats have been subjected to inconveniences and expense by the coal strike, but their owners are bearing it all with resignation, as clearing Western docks of coal by bringing it East is not exactly killing lake traffic.

The returns of losses by the May storm, so far received, show 23 steamers or sail vessels stranded or foundered. Fourteen of these, valued at $55,000, are reported as total losses. Thirty-four lives are reported lost. People swept from the breakwater at Chicago, where they had gone to fish, are included in the list. Nearly all of the damage was done on Lake Michigan.

Duluth sent out last week by lake 345,661 bbls. flour, the greatest quantity ever sent East in a week. During the same week mills at the head of the lake ground 95,500 bbls., or three times the corresponding week last year, and four times that of the week in 1892.

Iron ore shipments from Ashland for the season are more than double the total to the same time last season, agregating 420,000 tons. Total shipments out of Lake Superior have already been 1,250,000 tons, outside what has gone forward from Escanaba. Ore rates are strong at 80 cents a ton from the head of Lake Superior.

Sault Canal traffic for May reached 1,420,541 tons, as against 900,000 tons in May, 1893. Iron ore increased

from 287,000 to 888,500 tons; lumber from 55,484,000 to 87,687,000 feet; flour from 612,500 to 1,126,000 bbls. Passengers carried increased from 758 to 1,544. Coal carried through decreased from 391,000 to 68,500 tons.

The largest cargo ever carried out of Lake Superior was on the steamship Merida last week, 3,718 net tons of iron ore. It was loaded at Ashland. Last year the Merida's sister ship, Curry, carried 3,640 net tons, up to now the largest cargo.

First Trip of the Northwest.

The new steel passenger ship "Northwest," built by the Globe Iron Works Co., of Cleveland, for the Northern Steamship Co., made her first regular trip last week. She had the honor of opening the new Hay Lake Channel in the St. Mary's River. This channel has been under improvement for 12 years, and has cost about $2,700,000. It shortens a vessel's voyage by about 11 miles, taking out crooked and dangerous passages. She left Buffalo at 9 p. m. Tuesday, June 5, and reached Duluth, 1,000 miles at 2 p. m. Friday, after 9 hours' delay in the Sault River and stops at Cleveland and Detroit. Her running time, including expected stops, was 56 hours. The engines, quadruple expansion, are designed to make 130 turns per minute with a pressure of 225 lbs. at the smallest cylinder. As a matter of fact, the highest revolutions were 106 to the minute, and the pressure 190 lbs. on this first trip, while one engine and part of the boilers were out of service part of the run. It will be easy to get the expected sustained speed of 20 miles, and a deep water speed of 24 or better a little later. The ship is built on the ocean plan as far as practicable. She is 386 ft. long, 44 beam, and 34.5 deep to spar deck. She draws 14.5 ft. of water. There are accommodations aboard for 801 persons, including a crew of 148. Her boilers are designed to carry 266 lbs. of steam, and were tested to 500 lbs. They are 28 in number, of the Belleville tubular type. It is claimed that no merchant ship afloat is so perfect in appointment and details as this.

The Pass Fraud.

Since publishing an account of a pass swindle in our last issue, we learn that apparently the same person wrote to the Louisville & Nashville Railroad on April 19, requesting transportation for William Crosby from Cincinnati to New Orleans, and for Charles J. Unger, Cincinnati to Memphis, both being represented as employees of the Missouri, Kansas & Texas Railway. As in the previous cases, this letter bore the forged signature of Charles G. Hedge, Secretary, Treasurer and Controller of the M., K. & T. The Atchison, Topeka & Santa Fe, and New York, Susquehanna & Western roads are also having trouble with pass frauds.

CAR BUILDING.

The Youngstown Car Mfg. Co., which has been shut down for some time, resumed operations last week, having secured several large orders, among them being one from a railroad in Cuba.

The Carlisle Mfg. Co. has a contract for 95 new cars of different kinds, and the shops will resume about July 1, or as soon as the necessary material arrives. A portion of the cars must be completed by August 1.

The Wagner Palace Car Co. is building a number of compartment cars for the Cleveland, Cincinnati, Chicago & St. Louis, between Cincinnati and Chicago and St. Louis. They will be similar to those used between New York and Chicago on the New York Central and the Lake Shore roads.

BRIDGE BUILDING.

Allentown, Pa.—A petition with over 1,000 signatures has been presented to the County Court, asking for the bridging of the Little Lehigh Valley between the foot of Eighth street and Salisbury.

A jury has been appointed to view the sites for two county bridges over the Jordan Creek, one between Schnecksville and Lyon Valley, and the other between Lynnville and Weidasville.

Chicago.—The Secretary of War has granted a license for the building of the Northwestern elevated bridge across the Chicago river near Wells street. The bridge is to have no river pier.

Cleveland, Lorain & Wheeling.—General Manager Woodford and Chief Engineer Hanlan, of this road, were in Bridgeport, O., last week, and made an inspection of the numerous wooden bridges across Wheeling Creek, on the lower end of the line. It was decided to replace them with steel structures, beginning as soon as possible. The company has secured estimates for 56 new steel bridges, and the total amount is $62,000. Three years ago the same bridge work was under consideration, and it is stated that the lowest estimate at that time for the same structures was $122,000.

Easton, Pa.—The company owning the bridge over the Delaware river between Easton and Phillipsburg, N. J., has announced that it will erect a new structure of iron and steel, to cost about $80,000.

Eatonville, Pa.—The County Commissioners are to erect a new bridge at Mears' Grove, where the old structure was washed away. The new bridge will be of iron, 130 ft. in length, and 14 ft. in width.

Elliott City, Md.—Another span will likely be added to the iron bridge over the Patapsco River at Elkridge, now being rebuilt.

Elmira, N. Y.—A project is on foot to construct an overhead bridge on Grand Central avenue, leading into Eldridge Park, the city and Delaware, Lackawanna & Western Co. to bear an equal portion of the cost, estimated at $3,000.

Hespeler, Ont.—The bridge over the Speed river at this place is to be replaced by an iron structure. Tenders will be considered at a meeting of the Council during this month.

Homestead Pa.—In the United States Senate last week, on motion of Mr. Quay, the bill authorizing the construction of a bridge across the Monongahela river at Homestead, Pa., was passed.

Jersey Shore, Pa.—Bids will be received until July 3 for a new bridge at Allegheny and Railroad streets.

Johnstown, Pa.—The Mayor has vetoed the ordinance providing for the erection of a bridge over the Conemaugh River, at or near the site of the bridge destroyed in the flood of 1889, at the upper end of the Eleventh Ward, and making an appropriation of $3,000 to pay for its construction.

Louisburg, N. S.—The Dominion Bridge Co. has the contract to put up 25 spans for the Dominion Coal Co. at Louisburg, one span at Grand River, Richmond County; one at Country Harbor, Guysboro County (the last three for the government), and two for the Western Counties Railroad.

Meyersdale, Pa.—A jury has been appointed to view the site for a proposed bridge over Stony Creek, at Saint Creek station.

Millgrove, Pa.—The long toll bridge across the Oswayo will be rebuilt, having been wrecked by the recent flood. Three shorter bridges in this vicinity will also be rebuilt.

Moorefield, W. Va.—The County Court of Hardy County, W. Va., last week let the contract for a new bridge over Lost River, near Lost City, in that County. The contract for the masonry was let to Robert Oates, at $4 per perch, and the superstructure to the Wrought Iron Bridge Co., of Canton, O., at $1,260.

New Westminster, B. C.—The Mayor has received the plans of the proposed new iron bridge across the Fraser river from Engineer W. T. Jennings, of Toronto, Ont. They will be submitted to the Council for approval, after which they must be approved by the Provincial and Dominion Governments. The bridge will cost several thousand dollars.

New York City.—The President has selected the following Board of Engineers to recommend what length of span, not less than 2,000 ft., would be practicable for a bridge over the Hudson River under the terms of the act of Congress recently passed, authorizing the erection of a North River bridge by the New York & New Jersey Bridge Co.: Prof. W. H. Burr, of Columbia College, New York; George S. Morison, of Chicago; G. Bouscaren, of Cincinnati; Theodore Cooper, of New York, and Major C. W. Raymond, Corps of Engineers, U. S. A.

Philadelphia.—The Director of Public Works received bids last week for new bridge and sewer work, aggregating $329,000. Of the total amount involved about $300,000 is for sewers and the balance for bridges. In the latter classification was included the Forty-ninth street bridge over the West Chester Railroad, for which $25,000 was appropriated. In addition to the above the Survey Bureau will advertise for proposals for the Falls bridge, which will cost about $300,000; the Wyoming avenue bridge about $50,000, and the Torresdale avenue bridge, which will cost about $60,000.

The House of Representatives last week adopted a conference report on the bill to authorize the Pennsylvania & New Jersey railroad companies to construct a bridge across the Delaware river at Philadelphia. The bill provides that the channel span shall be 500 ft., and the other spans not less than 300 ft.

St. Anne de Beaupre, Ind.—The iron work on the new 220 ft. bridge of the Quebec, Montmorency & Charlevoix Railroad over the Grande River at Ste. Anne de Beaupre is being placed in position.

Scranton, Pa.—The Delaware, Lackawanna & Western has advertised for bids for a bridge under their tracks at Fellows street. The City Council has appropriated $5,500 as the city's share, and the company will pay about $6,500. The work will be done under the supervision of City Engineer Phillips.

Warren, Pa.—The town council has adopted a resolution looking to a conference with the Free Bridge Committee in regard to a new bridge over the Susquehanna at this point.

Wellsboro, Pa.—The Tioga County Commissioners have let the contract for building an iron bridge across Marsh Creek at Ansonia, to Nelson & Buchanan, of Chambersburg, Pa., for $3,000. The bridge is to be completed by August 15.

Williamsport, Pa.—The County Commissioners have advertised for proposals for rebuilding the iron bridges at Jersey Shore, Muncy, Fields' Station and Perryville. The old spans of the Market street structure will be used for the bridges at Fields' and Perryville, which will be one-span structures. The five-span structure across the Susquehanna at Muncy will be an entirely new one. Bids must be in by June 18, and the improvements completed by Sept. 18.

Williamstown, Pa.—The County Commissioners will be petitioned to build an iron bridge over the creek at this place to replace the structure washed away by the recent flood.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston, Revere Beach & Lynn, $2 per share, payable July 2.

Chicago & Eastern Illinois, quarterly, 1½ per cent. on the preferred stock, payable July 2.

Chicago & Northwestern, 1¾ per cent. on the preferred stock, and 3 per cent. on the common stock, payable July 5.

Cleveland, Cincinnati, Chicago & St. Louis, quarterly, 1¼ per cent. on the preferred stock, payable July 2.

Manhattan Elevated, quarterly, 1½ per cent. payable July 2.

New York & Harlem, 4 per cent. payable July 2.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Hancock & Calumet, annual, Hancock, Mich., July 10.

Mineral Range, annual, Hancock, Mich., July 10.

Chicago, St. Paul, Minneapolis & Omaha, annual, Hudson, Wis., June 9.

St. Joseph & Grand Island, annual, Elwood, Kan., June 12.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Master Mechanics' Association* will hold its annual convention at Saratoga, N. Y., beginning June 18.

The *International Association of Car Accountants* will hold its annual convention at Old Point Comfort, Va., beginning June 19.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York city, on the third Thursday in each month, at 8 p m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m. The annual convention will be held at the Cataract House, Niagara Falls, N. Y., beginning June 20.

The *Western Society of Engineers* meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 51 Lakeside Building, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday in each month, at 8 p. m.

The *Foundrymen's Association* meets at the Manufacturers' Club, Philadelphia, Pa., on the first Wednesday in each month.

Engineers' Club of St. Louis.

The club met on June 6, at 1600 Lucas place. Mr. Robert Moore was chosen chairman pro tem. The Executive Committee announced the receipt of the resignation of Charles W. Melcher as treasurer, and the resignation was accepted. Mr. Thomas B. McMath was elected by ballot to fill the vacancy.

A paper by Mr. A. A. Stuart entitled "Some Notes on the Brooklyn Elevated Railway, Brooklyn, N. Y.," was then read by Mr. Julius Baier. The paper was accompanied by detailed drawings, showing the essential features of the structure and buildings, together with specifications for the work, and a map showing the area served. Particulars of improvements made in recent construction, together with first costs, cost of operation and maintenance, were also presented. The historical features of the enterprise were briefly touched upon. In the discussion, which was participated in by Messrs. Schaub, Moore, Flad and Wheeler, the details of connection between posts and foundations were brought up, as well as the present condition of the iron work of old structures, and the amount of vibration.

A paper by Mr. J. W. Woermann on "Concrete Construction on the Illinois and Mississippi River Canal" was then read by Mr. P. M. Bruner. This work, which is better known as the Hennepin Canal, connects the Illinois River near its great bend with the Mississippi near Rock Island. An elevation of over 200 ft. is crossed, necessitating numerous locks. It being impossible to get a good grade of limestone near at hand for the masonry, it was decided to use concrete exclusively for that portion of the work now in hand. It, therefore, represents one of the most extensive pieces of concrete construction in this country. The processes employed, the proportions of the ingredients, the amount of labor, rate of progress and total cost were fully stated. A brief discussion followed, in which Messrs. Moore, Schaub, Bryan and Baier participated.

Engineers' Club of Cincinnati.

The regular monthly meeting was held on May 17, with 26 members present. Four new members were elected. It was resolved to omit the meetings during July and August. Col. Anderson gave an account of his visit to the Canal Investigating Committee at Columbus, on March 29, in the interest of the proposed ship canal from the Lakes to the Ohio River. Mr. S. Whinery read a paper on "Determining the Sizes of Railroad Culverts." He went into the subject very thoroughly, describing the proper method to be used, taking into account all the conditions involved, the amount and duration of rainfall, the area drained and the inclination of the water shed, and in this connection the velocity of flow.

PERSONAL.

—Mr. Ambrose S. Murray, Jr., has been appointed Receiver of the Dansville & Mount Morris Railroad in New York State.

—Mr. Henry C. Rouse, Chairman and President of the Missouri, Kansas & Texas, and one of the Receivers of the Northern Pacific, will sail for Europe on June 27, to be absent about five weeks.

—Mr. Arthur H. Johnson, Consulting Engineer to the

Johnson Railroad Signal Co., will fill temporarily the position of Western Agent for the Company, vacated by Mr. H. M. Sperry, June 10th.

—The fees of Mr. Thomas C. Platt and Mr. Marsden J Perry, as Receivers for the New York & New England Railroad Co., have been fixed by the United States Court at $1,000 a month each. They were appointed receivers last December.

—Mr. W. H. Truesdale, who has been Receiver of the Minneapolis & St. Louis road since January, 1888, and its President since 1887, has been elected Third Vice-President of the Chicago, Rock Island & Pacific road, in charge of its traffic department.

—Mr. John B. Adams, conductor of the first passenger train from Springfield, Mass., to Albany, N. Y., over the old Western railroad in 1841, died in Springfield, Mass., on June 11, at the age of 80. Mr. Adams worked for railroad contractors in Massachusetts and Rhode Island as early as 1837, and was paymaster in the construction service on the Western road before he became conductor. He was a distinguished type of the conductor of the old times, when men who ran passenger trains were prominent citizens in the communities where they were known. Mr. Adams retired in 1873.

—Col. Daniel Davenport, a prominent contractor and railroad builder of St. Johns, N. F., was found dead in his room at a New York hotel on June 11. Mr. Davenport was born in Lansingburg, N. Y., and was 60 years old. He started in business as a railroad contractor, and had built railroads in Kentucky, Tennessee, Illinois, Alabama, and in Africa, Brazil and Chili. His last contract in railroad building was in Chili, but owing to the revolution he was forced to stop work and returned to New York in February. He went to Newfoundland shortly after, but returned in March to New York and was arranging to take up railroad construction in San Domingo.

—Major John C. Paul, President and Receiver of the American Steel Wheel Co., died at Plainfield, N. J., from paralysis, on June 12. Major Paul secured his title by service in a Pennsylvania regiment during the civil war. In 1865 he was connected with the United States Railway Postal Service, and was afterwards Manager of the Allegheny Car & Transportation Co. In 1881 he became Superintendent of the New York Division of the Woodruff Sleeping & Parlor Coach Co., then General Superintendent and General Manager in 1884. He was with the Pullman Car Co. as Superintendent of Equipment, but resigned it in 1891 to become Vice-President of the American Steel Wheel Co., of which he soon became President. He was appointed Receiver last year. Major Paul was 53 years old, and leaves a widow and a young son.

—Mr. Joseph K. Bole, President of the American Steel Castings Co., died suddenly of apoplexy at Chester, Pa., on June 8, at the age of 46. Mr. Bole was well-known in the iron and steel trades, having been connected with the Otis Steel Co., at Cleveland, since 1874. He resigned his position as one of the managing Directors in that company, after the controlling interest was sold to an English syndicate, and became President and General Manager of the American Steel Castings Co. early this year. He had taken up his residence at Chester, but his family had not yet moved from Cleveland. Mr. Bole was married in 1872 to Miss Linda E. Patterson, of Pittsburg, who, together with five sons and two daughters, survives him. Mr. Bole was one of the Receivers of the Valley Railway of Ohio, having been a Director in that company since April, 1891. Although enthusiastically devoted to his business, Mr. Bole was a lover of books, and had a large library, which included a considerable collection bearing on the history of railroads. He was a wonderfully active and genial man and will be greatly missed.

—Mr. George W. Parker, President of the St. Louis, Alton & Terre Haute, is completing 25 years of service as General Manager of the company, and 32 years' connection with the road. The bondholders and stockholders, at the recent annual meeting, adopted resolutions "recording their grateful recognition of the eminently faithful and efficient services of George W. Parker in the various offices of Counsel, General Manager, Treasurer, Vice-President and President of this Company, extending over a period of 32 years. Their respect and regard for him have continually been increased by reason of the exceptional capacity and integrity which have been displayed during his never-failing devotion of his fullest energies to the interests of this company in the most conscientious manner." The stockholders extend their congratulations to him upon the continuance of health and strength, with the hope that they may not fail for many years to come. Mr. Parker is requested, at his convenience, to indulge himself in a lengthened vacation for well earned rest, and to that end a leave of absence for six months is cordially tendered.

ELECTIONS AND APPOINTMENTS.

Baltimore & Potomac.—The annual meeting was held in Baltimore, Md., on June 6, at which 95,000 shares of stock were represented. The following Directors were elected: Frank Thomson, R. D. Barclay, Philadelphia; John Cassels, Washington, D. C.; William T. Walters, B. F. Newcomer, Baltimore, Md.; Robert C. Hall and Samuel Cox, Jr. Ex-Governor Oden Bowie was re-elected President; Frank Thomson, Vice-President; William J. Sewell, Second Vice-President; James P. Kerr, Secretary, and Robert W. Smith, Treasurer.

Canada Southern.—The annual meeting was held in St. Thomas, Ont., on June 6, and the following Directors were elected: Cornelius Vanderbilt, William K. Vanderbilt, James Tillinghast, Chauncey M. Depew, Charles F. Cox, Samuel F. Barger, Joseph E. Brown, Edward A. Wickes and Nicol Kingsmill.

Chicago & Northwestern.—The old Directors and executive officers were re-elected at the annual meeting held in Chicago on June 7. The only changes were the election of Oliver Ames, as a 2d director, in place of his father, Frederick L. Ames, deceased, and the election of Horace Williams as a member of the Executive Committee, in place of the late Frederick L. Ames.

Chicago, Rock Island & Pacific.—The annual meeting was held in Chicago, June 6, the old Board of Directors beingre-elected. The board of directors organized is as follows: R. P. Flower, Benjamin Brewster, H. R. Bishop, H. M. Flagler, Alexander E. Orr, David Dows, Jr., and Alexander T. Van Nest of New York; H. H. Porter, Marshall Field, John De Koven, R. R. Cable and W. G. Purdy of Chicago; George G. Wright of Des Moines, Ia.

The following officers were elected: President, R. R. Cable; Vice-President, Benjamin Brewster; Second Vice-President, Treasurer and Secretary, W. G. Purdy; Third Vice President, W. H. Truesdale; Assistant Secretary and Assistant Treasurer at New York, G. T. Boggs; Assistant Treasurer and Assistant Secretary at Chicago, J. F. Phillips.

Chicago, St. Paul, Minneapolis & Omaha.—At the annual meeting at Hudson, Wis., on June 9, the following Directors were elected to serve for three years. M. L. Sykes, J. M. Whitman, Thomas Wilson and John A. Humbird. The Directors re-elected all of the old officers except Robert W. Clark, Local Treasurer at St. Paul, who was succeeded by Charles W. Nash.

Great Northwest Central.—The annual meeting of the shareholders of the railroad was held last week, Vice-President J. A. Gemmell in the chair. The Directors' report showed the result of the litigation to be that the judgments of the High Court of Justice, Ontario, have become absolute, declaring J. A. Codd and others disqualified from being Directors, and holding that Mr. Codd's proceedings in seeking to hold meetings of shareholders are void. The action by the company against contractor Charlebois has resulted in a judgment reducing the judgment obtained by Charlebois on the consent given by J. A. Codd, while acting as President of the company, to an amount which will enable the company to progress. Messrs. Delap, Gemmell, May, Cawthray, Merritt-McDonald and Senkler were elected Directors. Subsequently Delap was re-elected President, and Gemmell Vice-President.

Hoosac Tunnel & Wilmington.—F. M. Stevens has been appointed Master Mechanic, with headquarters at Readsboro, Vt. Mr. Stevens was lately connected with the Baldwin Locomotive Works.

Jacksonville, Tampa & Key West.—F. E. Tubbs has been appointed Master Mechanic, with office at Palatka, Fla. William Rutherford, General Master Mechanic, having resigned to accept service elsewhere. The office of General Master Mechanic has been abolished.

Lehigh Valley.—W. H. Gummere has been appointed General Baggage Agent of this company, with office at South Bethlehem, Pa. The office of Assistant General Baggage Agent has been abolished.

Louisville & Nashville.—Joseph A. Steltenkamp formerly Florida Passenger Agent has been appointed Traveling Passenger Agent, with headquarters at Cinncinati, O., to succeed Sidney J. Gates. C. W. Hutchinson has been appointed City Passenger Agent at Cincinnati.

Minneapolis, St. Paul & Sault Ste. Marie.—The annual meeting was held in Minneapolis, Minn., on June 6, and the following Directors were elected: Thomas Lowry, John Martin, R. B. Langdon, W. D. Washburn, J. S. Pillsbury, C. H. Pettit, W. C. Van Horne. The officers elected were: Thomas Lowry, President; John Martin, Vice-President; F. D. Underwood, General Manager; Charles F. Clement, Secretary and Treasurer; C. W. Gardner, Auditor.

Montreal & Western.—The annual meeting was held on June 7, and the following Directors were elected: Hon. J. A. Chapleau, H. J. Beemer, Jacques Grenier, Frank Brennan, J. D. Rolland, Dr. Brisson and Hon. J. J. A. Desjardins.

Ohio Southern.—At the annual meeting of the company the following officers were elected: President and General Manager, G. W. Saul,; Vice-President, William Chisholm; Treasurer, F. W. Rittman; Secretary and Auditor, S. Y. McNair. The same officers were elected for the Cleveland, Akron & Columbus. The two roads being owned by the same interests will be operated under one management in the future.

Queen & Crescent.—The following changes have been announced on this system: S. C. Ray, Traveling Passenger Agent, at Birmingham, Ala., transferred to Dallas, Tex., vice J. R. McGregor; J. R. McGregor, Traveling Passenger Agent, at Dallas, Tex., transferred to Birmingham, Ala., vice S. C. Ray; W. A. Beckler, Traveling Passenger Agent, at Jacksonville, Fla., transferred to 111 Adams street, Chicago, Ill., with the title of Northern Passenger Agent, vice A. J. Lytle; A. J. Lytle, Northern Passenger Agent, Chicago, Ill., transferred to Chattanooga, Tenn., with title of Division Passenger Agent, vice E. T. Charlton.

St. Paul & Sioux City.—At the annual meeting of stockholders, held at St. Paul, Minn., on June 9, the Directors and officers whose terms expired on that day were re-elected.

Winona & Southwestern.—At the annual meeting held at Winona, Minn., June 10, the following officers were elected: H. W. Lamberton, President; V. Simpson, Vice-President; Thomas Simpson, Secretary, and M. G. Norton, Treasurer.

RAILROAD CONSTRUCTION,

Incorporations, Surveys, Etc.

Baltimore & Ohio.—Mr. Thomas M. King, second Vice-President, and Mr. W. T. Manning, Chief Engineer of the Baltimore & Ohio Railroad Co., spent some days last week in Southwest Virginia, to look over the country between Lexington and Roanoke, with the view of extending the Valley Branch to the last-named city. The extension of this branch to Roanoke has been urged for some years by the people living along the route. Mr. King says that the company is not likely to act for some time on whatever report he and Mr. Manning may make. Mr. King went over the whole country between Lexington and Roanoke, 52 miles. Some of the country, he says, is rugged and railroad construction will be expensive.

Bangor & Aroostook.—Orders have been issued to begin work in earnest on the northern end of the road beyond Houlton, Me. About 1,000 men, it is stated, will be placed on the road.

Bedford & Blair County.—An engineer's office has been opened in Bedford, Pa. A party in charge of William Heckerman, of that place, is now locating the branch into Somerset County. Some 300 men are at work on the grading. E. A. Tennis, of Thompsontown, Pa., has the contract to build and equip the road.

Buffalo & Susquehanna.—The officials are considering the question of extending the line from Cross Forks down Kettle Creek to Westport, Pa. It would open up a fine coal, fire clay and timber section. Messrs. A. H. Mann and Col. W. A. Simpson, of Lock Haven, had a conference at Trout Run last week with C. W. Goodyear, of Buffalo, President of the road, in regard to this extension.

Cannelton.—The railroad has been organized by J. Tatnall Lea, of Philadelphia, and others, for the purpose of acquiring and operating about two miles of track, which was built in 1893 by the Cannelton Coal Co., and extends from the track of the Kanawha & Michigan Railroad at Cannelton, W. Va., to a point on Smithers Creek, where the Cannelton Coal Co.'s gas coal mine is located. It is intended in the future to continue up Smithers Creek, to enable the Cannelton Coal Co. and other owners of coal lands, to open additional mines, and deliver the product to the Kanawha & Michigan. There is no present intention of doing additional construction or other work, beyond surveys and locating of line for future use.

Charleston, Clendenin & Sutton.—The extension of this road from its present terminus at Clendennin, Kanawha County, W. Va., to Sutton, Braxton County, is now understood to have been arranged definitely. Messrs. J. Wainwright and Charles Young, of Pittsburg, Pa., who have interested themselves in the enterprise, made a trip over the proposed route up Elk River three weeks ago, and promised that if free right of way was secured, they would arrange to furnish the capital for building the line. Last Friday they met the Directors of the road in Charleston, W. Va., and received from them a satisfactory report as to the possibilities of securing this concession. The annual meeting of the stockholders will be held this month at Charleston, and at that time a majority of the capital stock will be transferred to Messrs. Young & Wainwright and those they represent, and the work begun as soon thereafter as possible.

Clendenin & Spencer.—Secretary of State Chilton, of West Virginia, last week issued a charter to this company, with a capital stock of $200,000 subscribed. The incorporators are W. S. Lewis and Charles Lewis, of Charleston, W. Va.; H. O. Wyatt, W. A. Ripley, and W. C. Wayhop, of Carlos, Roane county, W. Va. The road is to begin at the town of Clendennin, in Kanawha County, and follow the most direct route to Spencer, Roane County. This will connect with the Charleston, Clendennen & Sutton road at Clendennin, and with the Ravenswood, Spencer & Glenville road at Spencer. It will be a connecting link between the Camden system of roads in West Virginia, including the West Virginia & Pittsburg, Monongahela River and Ohio River roads, and the Chesapeake & Ohio and Kanawha & Michigan, besides developing a large area of coal and timber land.

Easton & Chestertown.—A certificate of incorporation was filed at Centreville, Md., June 8, by James A. Pearce and Chas. T. Westcott, of Chestertown. The capital stock will be $500,000. The incorporators are George E. Haddaway, W. Goldsborough, of Easton, and P. H. Feddeman, of Centreville. The road will run from Easton to Queen Anne' station, thence to Centreville and Church Hill, terminating at Chestertown. It will run nearly parallel with the Queen Anne & Kent branch of the Philadelphia, Wilmington & Baltimore. This is the third railroad recently incorporated in that section.

French Creek & Little Kanawha.—At the election held in Meade and Banks districts, Upshur County, W. Va., last week, to determine the question of issuing $30,000 bonds, to be subscribed to the capital stock of this railroad, the proposition was defeated by 13 votes. Those favorable to the subscription think a majority of the voters of the two districts favor the plan, and another election will be asked for.

Hampden & Waterport.—Gen. Henry L. Mitchell and the municipal authorities of Hampden, Ill., have laid out the right of way for this railroad company. It is the intention of the company to have the road running this year as far as Frankfort.

Lancaster & Hamden.—This railroad was projected and partially built by E. P. Buell & Co., of Tarlton, O., but it has been operated since September, 1893, by J. C. Short, as Receiver. At the time of the appointment of the Receiver the road was completed and in operation from its junction with the Cincinnati & Muskingum Valley road, about two mile east of Stoutsville, O., southward to Tarlton, a distance of about seven miles, and was graded and partially bridged and the ties laid from Tarlton southward about 23 miles, to a point four miles south of Bloomingville, making about 30 miles. The United States Court at Cincinnati has authorized the Receiver to complete the road as far as graded, which is now being done. The court has authorized the issue of $150,000 of Receiver's certificates, the same to be a first lien on that part of the road. The line of road as projected is from Columbus via Tarlton and Bloomville, to Hamden and Wellston, a distance of 75 miles, of which the above mentioned 36 miles is a part. It is expected that the entire line will be completed between Columbus and Wellston during the current year. The railroad company is authorized to issue $20,000 of stock, and $20,000 of first mortgage bonds per mile of its entire main line of road. The office of the Receiver is at 45 Broadway, New York city.

Leesburg, Emeralda & Northern.—This company has been organized in Florida to build a railroad from Leesburg north to Emeralda, Fla., a distance of 13 miles. No surveys have been made. The officers are: President, R. L. Anderson, Ocala, Fla; Vice-President, C. P. Lovell, Orange Bend, Fla.; Treasurer, Robert McNamee, Leesburg, Fla., and Chief Engineer, C. S. Noble, Leesburg.

Los Angeles, Pasadena & Altradene.—This company has been incorporated in Los Angeles, to build an electric railroad between the points named. C. L. Strange and W. Fergueson, of Pasadena; E. C. Haskell, of Los Angeles, and Thomas J. Barbour, of San Francisco, are Directors. The road is to be in operation in six months.

New Roads.—A survey was begun this week for a line of railroad between Cavalier and Drayton, N. D. This project is intended to give the citizens of Cavalier County, which is in the hard wheat belt, an outlet to Duluth and the Twin Cities. The road will be about 40 miles in length, and D. W. Huris, of Cavalier, N. D., is the principal projector.

Red River Valley & Western.—The Great Northern, which has acquired possession of this road, has filed with the Secretary of North Dakota a resolution authorizing the extension of the line through Cass, Barnes and Stutsman counties to the James River.

South Jersey.—Official announcement is made by the Railroad Company that its new line to Cape May, N. J., will be formally opened for regular traffic on June 23. A large construction force is now engaged on the work. The crossing frog at Woodbine, which was forcibly removed by the West Jersey some weeks ago has been replaced, and construction trains are now crossing there, and the one at Cape May Court House has also been put in. The company has been directed by the courts to make an overhead crossing of the West Jersey tracks at Woodbine. A level crossing is permitted temporarily.

St. Louis, Grand Tower & Southern.—We are informed from Chester, Ill., that President T. N. Chase has secured most of the right of way for this road along the east side of the Mississippi River from East St. Louis to Grand Tower, Ill. He reports that contracts have all been let. John Scott has from East St. Louis to Chester; McCabe, Penny & Meyers, from Chester to Grand Tower;

Tansey & Ware, from Grand Tower to Cairo. M. English has the contract for laying the track, according to the same report. Robinson & Mass have the contract for ties and bridge lumber. Carrter Brothers have the contracts for bridging.

Toledo & Ohio Central Belt.—The proposed belt line around the city of Columbus, O., is meeting with further opposition. The Columbus Terminal Co. organized some years ago, claims that the Toledo & Ohio Central has taken part of its right of way, and has brought an injunction suit. The Columbus Terminal Co. has been using the maps and right of way of the Columbus, Lima & Milwaukee. The Columbus, Hocking Valley & Toledo has also enjoined work on the site of the proposed terminals on the west side of Columbus.

United Verde & Pacific.—This road is being built by W. A. Clark, of Butte, Mont., from Jerome to a connection with the Santa Fe, Prescott & Phœnix road at a point not yet decided. The surveys are nearly completed, and construction has been begun. The work will be let in small contracts, covering ¼ mile to 1 mile, to various parties. About 10 miles of the line is mountain work, and 15 miles valley line. The maximum grade is 3 per cent. compensated. The road is being built with a gage of 3 ft. E. H. Bechler is Engineer for the road. J. L. Giroux is President, H. J. Allen is Secretary, the addresses being Jerome, Ariz.

Wichita Falls.—Application has been made in Texas for a charter for the Wichita Falls Railroad Co., to construct a line from Wichita Falls to Henrietta, Tex.

GENERAL RAILROAD NEWS.

Brigantine Beach.—Last week the Holland Trust Co., of New York, made application for the appointment of a Receiver for the Brigantine Beach Railroad. Judge Carrow, of Camden, has been appointed Receiver.

Chicago & Eastern Illinois.—The Chicago & Eastern Illinois Railroad Co., and the Chicago & Indiana Coal Railway Co., filed articles of consolidation on June 7 with the Secretary of the State of Illinois. The consolidated concern will be known by the former name. The capital stock is $25,000,000. This action is merely formal. The companies have been operated together for some years, and the merger has been practically complete.

Chicago & Northwestern.—A preliminary report of the earnings for the year ending May 31 has been issued. The figures are given below, with the actual results for the two previous years.

	1894.	1893.	1892.
Gross earn	$31,971,885	$33,059,747	$31,422,272
Expenses and Charges	27,694,157	28,280,036	26,502,087
Balance	$4,277,728	$4,779,711	$4,920,185
Dividends	3,906,594	3,906,561	3,675,735
Surplus	$371,133	$873,150	$1,244,450
Western lines	39,528	72,324	44,759
Total Surplus	$410,662	$945,474	$1,289,209

The gross earnings decreased $1,087,862. Operating expenses and fixed charges decreased $585,879. The surplus of the Northwestern proper for the year decreased $502,017, and the surplus of the Northwestern and the trans-Missouri lines together decreased $534,815. The usual semi-annual dividend of 3 per cent. on the common stock, and the customary dividend for the quarter of 1¾ per cent. on the preferred stock have been declared payable July 5. This makes the total dividends for the fiscal year ending May 31, 6 per cent. on the common stock, and 7 per cent. on the preferred stock.

Chicago, Rock Island & Pacific.—The earnings for the year ending March 31 last, made public last week, prove to be very favorable. The gross earnings were greater than in 1892, and the operating expenses were reduced nearly twice as much as the increase reported in gross earnings, so that an increase of 27 per cent. is shown in net earnings. The following table gives the comparison for the last years:

	1894.	1893.	Inc. or Dec.	
Gross earn	$21,0-9,073	$20,971,110	I	$67,963
Oper. expen	14,977,479	15,083,689	D	106,210
Net earn	$6,061,594	$5,887,421	I	$174,173
Other income	43,038	60,000	D	16,962
Total net income	$6,104,632	$5,947,421	I	$157,211
Fixed charges	$4,049,901	$3,899,368	I	$150,533
Dividends	1,846,232	1,846,232		
Total payments	$5,896,133	$5,745,600	I	$150,533
Surplus	$208,499	$201,821	I	$6,678

Dansville & Mount Morris.—On the petition of Edward A. Stevens, of Hoboken, Judge Wallace, of the United States Circuit Court, at New York, has appointed Ambrose S. Murray, of New York, Receiver for the railroad company. The company was organized in October, 1891, with a capital stock of $50,000, and it is now indebted in the sum of $150,000 to the Farmers' Loan & Trust Co., with promissory notes and other indebtedness, amounting to over $100,000. The suit is a friendly one.

Fonda, Johnstown & Gloversville.—James S. Burr has sold his stock in this railroad to Superintendent R. T. McKeever, who has been elected a director to succeed Mr. Burr. The stock consisted of 100 shares; the price paid was $15,000. Mr. McKeever is a relative to H. Walter Webb and Dr. Seward Webb. The road is operated from Fonda, N. Y., on the New York Central road to Northville, 226 miles. The road has been paralleled by an electric line, which purchased a majority of the stock in the steam road, and has operated it recently.

Louisville Southern.—Application was made in the United States Court in Cincinnati last week for a decree for the foreclosure of the Louisville Southern Railroad, which is one of the properties embraced in the Richmond Terminal reorganization plan. The Louisville Southern is now in the hands of Receivers Fink and Spencer, who were appointed last July, and it is being managed by their agent, Samuel M. Felton, who was formerly President of the road, and is now Receiver of the Cincinnati Southern. The sale will be on July 7.

Montreal & Sorel.—The sheriff's sale of the railroad has taken place at Montreal, Que., the Hon. Mr. Tourville being the purchaser for $1,600. He is the President of the syndicate now operating the road to St. Lambert, Que., the other members being Joel Leduc, J. M. Fortier and H. Beauchemin. They hold 1,480 debentures of £100 each, upon which interest is due since 1884. Among those present at the sale were the members of the syndicate, C. N. Armstrong, George Ball, A. Wurtele, E. C. Wurtele and others.

New York Central & Hudson River Railroad.—The gross earnings for the month of May, 1894, were $3,304,802, a decrease of $696,810 over the same period in 1893. The number of miles operated was 2,395, an increase of 298 miles over 1893.

New York & New England.—Judge Wallace, of the United States Circuit Court, has fixed the salaries of Thomas C. Platt and Marsden J. Perry, Receivers of the New York & New England Railroad, at $1,000 a month.

The bill incorporating the New England & New York Railroad Co. (the reorganized New York & New England) was passed last week under a suspension of the rules in the House of Assembly of the Massachusetts Legislature, and has since become a law.

The Receivers of the company have made application in the United States Circuit Court in Boston for permission to issue $150,000 of Receivers' certificates. Judge Colt has appointed Mr. William G. Russell, of Boston, a special master to take evidence.

Oregon Pacific.—This railroad was again offered for sale in Corvallis, Ore., on June 7, but no bid being made a new order of sale was made at the adjourned term of court July 20.

Southwestern of Georgia.—The Circuit Court of Appeals, in New Orleans, has affirmed the decision of Judge Jackson, charging the Southwestern Railroad with $2,000,000 of the tripartite bonds of the Central of Georgia. Judge Pardee dissented. The decision is favorable to the Savannah & Western, and other guaranteed bonds of the Central Railroad of Georgia.

Southern Pacific.—The statement of earnings for April is as follows:

	1894.	1893.	Inc. or Dec.	
Miles	6,624	6,664	I	40
Gross earn	$3,727,567	$3,900,204	D	$172,637
Oper. expen	2,516,462	2,664,943	D	148,481
Net earn	$1,211,105	$1,235,261	D	$24,156
For four months:				
Gross earn	$13,681,710	$14,989,844	D	$1,308,134
Oper. expen	9,487,852	10,294,211	D	806,359
Net earn	$4,193,858	$4,695,633	D	$501,775

TRAFFIC.

Traffic Notes.

The Erie has shortened the time of its fastest train from New York to Chicago one hour, making the time 29 hours.

The New York Chamber of Commerce has memorialized Congress, recommending the passage of the law to permit pooling by the railroads.

The New York Central has started a fast freight train between New York and Montreal, over its Adirondack division, running it through in about 36 hours.

The New York, New Haven & Hartford now runs a daily fast freight train from New York to Boston. It leaves New York at 3 p. m., and runs through in about 10 hours.

No progress has yet been made toward a renewal of the trans-continental passenger agreement, nor is any likely until the Atchison and Southern Pacific come to a new agreement.

St. Louis east-bound lines have put in effect an agreement on east-bound freight business practically the same as the new agreement of the Chicago lines, and as a result rates are being better maintained in that territory than for some time past.

The Panama Railroad is to run steamships between New York and Colon, having chartered three ships from the Standard Oil Co. The ships owned by the Pacific Mail Steamship Co. will now be run by their owner, so that there will be two lines.

The washouts on the Union Pacific west of Umatilla have seriously interfered with through service the past two weeks. Trans-continental lines from St. Paul have all suffered more or less, and have been obliged to decline all perishable freight. Passengers for Portland, Or., are being sent via Portland and the Shasta route.

The New York & Putnam Railroad, formerly the New York & Northern, has abandoned its freight station at pier 39, East River, New York city, and the business will hereafter be done at the West Thirtieth street station of the New York Central, which company now controls and operates the New York & Putnam, calling it the New York & Northern division.

Messrs. J. M. Hall, George DeHaven and J. M. Chesbrough, acting as arbitrators, have awarded the Nickel Plate a 25-cent differential between Buffalo and Erie; 75 cents first-class, and 50 cents second-class between Buffalo and Cleveland; 25 cents between Erie and Cleveland; $1.50 first-class, and $1 second-class between Erie and Chicago, and Cleveland and Chicago; all applicable in both directions. The arbitrators declined to authorize a differential on mileage tickets.

The Southern Railway & Steamship Association met in New York on Tuesday and Wednesday of this week. The very low freight rates (first established by the steamship lines) now prevailing from New York to southeastern territory, were discussed at great length but no result is reported. Commissioner Stahlman made an extended defense of his management, which it appears had been criticised. The New York papers print the following list of subjects which came before the meeting: First—Shall rates be restored to the Southeast? Second—Refusal of the Cincinnati, New Orleans & Texas Pacific to pay fines assessed by the Board of Arbitration. Third—Arrears of the Cincinnati, New Orleans & Texas Pacific Co., and other members on account of current expenses. Fourth—Failure of the same road to abide by the decision of the Board of Arbitration, limiting the shrinkage at Louisville and Cincinnati to 3 per cent. including bridge tolls. Fifth—Absorption of river transfers at Vicksburg by the Alleghany Valley in violation of the association agreement. Sixth—Failure of certain members to charge short line proportions on Western traffic, from March 1 to March 30. Seventh—Failure of the Cincinnati, New Orleans & Texas Pacific and Memphis & Charleston to allow the privilege of inspection. Eighth—Refusal of the Cincinnati, New Orleans & Texas Pacific to observe rates established under the rules of the association between New Orleans, Chattanooga, etc. Ninth—Consideration of the decision rendered by the United States Court of Appeals in the case of the Interstate Commerce Commission vs. the Cincinnati, New Orleans & Texas Pacific, known as the Social Circle case. Tenth—Failure of the Norfolk & Western to maintain rates fromthe East.

The trustees of the New York & Brooklyn Bridge have fixed the price of two railroad tickets at 5 cents on and after July 1. This is the same rate as that heretofore allowed where packages of 10 tickets were bought. The bridge traffic receipts amounted to $105,293, about $7,000 less than for the corresponding month last year.

Southwestern Traffic Association.

At the regular meeting of the Association at St. Louis, June 7, 8 and 9, action was taken as follows: Rates were established from the Missouri River to Texas points, on flour 40 to 45 cents per 100 lbs.; wheat 35 to 40 cents; corn and oats 33 to 37 cents. These rates were also made applicable from Denver and intermediate points on direct lines in Colorado and Kansas to points in Texas on the Fort Worth & Denver City, the Rock Island and the Santa Fe lines. Re-consignments at the Missouri River are to be under the inspection of a joint agent reporting direct to the chairman of the association. The basis of divisions known as the 50 per cent. basis was agreed to from lower Mississippi River points, Houston and Galveston, to City of Mexico, the lines north of Rio Grande crossings being allowed 72 per cent. of the through rates on business to Monterey.

Chicago Traffic Matters.

CHICAGO, June 13, 1894.

The Atchison, concluding that some of the other members of the excursion agreement were not observing it in good faith, has terminated its connection with the agreement and announces that it proposes to protect its interests. The other lines claim that the information on which the Atchison bases its action relates to rates and arrangements which were in effect before the agreement was made and which were cancelled subsequently. It is not expected that any retaliatory measures will be inaugurated by the Atchison unless the situation becomes more critical than at present.

The lake and rail lines from Chicago, Milwaukee and Lake Superior ports have determined to try a new plan for the maintenance of rates east-bound. They have elected E. J. Henry, Chicago agent of the Lehigh Valley, temporary vice-commissioner in charge of all east-bound traffic. The agreement under which they propose to regulate the business provides for the daily announcement of rates by the commissioner by wire to the different points, and agents are to be required to absolutely maintain them. The chief difficulty heretofore has been over export rates and the divisions among the carriers themselves. Arrangements are now pending looking to an agreement as to the proportions to be carried by each Lake line and by each Trunk line. When this question is settled, as it is expected to be within the next two weeks, it is probable that the commissioners will be able to so distribute the traffic as to equalize the various ocean gateways and thus remove the existing excuse for demoralization.

The result of the meeting at St. Paul last week was a unanimous agreement on the part of the interested lines to advance the rate on flour and millstuffs via Lake lines from Minneapolis to New York and common points to 22½ cents per 100 lbs., effective June 18, and notice has been given by Western lines that the rate on flour and millstuffs from Minneapolis and St. Paul via Chicago, Montreal and New London to New York, will be advanced to 27½ cents per 100 lbs.; to Boston and common points 29½ cents., effective on the same date. Western Freight Association lines are authorized to accept 9.2 cents as their proportion west of Chicago; same proportion to be accepted when delivery is made to boat lines at Milwaukee and Chicago, provided the boat lines agree to protect the through rate. A lake and rail route of 24½ cents to Boston points, in connection with the Ogdensburg Transit Co., is also authorized.

Considerable importance attaches to the meeting of the Joint Committee in New York to-day at which consideration is to be given through rates with Western and Eastern lines. It is probable that the agreement will provide for the future making of these rates based on the sums of the locals, Western lines to equalize on west-bound tonnage and Eastern lines on east-bound. The Burlington has given notice that on and after June 11 it will cease to prorate on grain rates to Central Traffic Association territory.

The Chicago roads are making some effort to secure unanimous action of all the roads looking to the wholesale prosecution of scalpers under the State law. At present, however, a sufficient number of the roads have not signified their assent to the proposed plan to warrant proceeding under it.

St. Paul-Chicago passenger agents have asked the Central Traffic Association to join them in making rates from St. Paul to Eastern points for teachers on vacation as follows: Boston or Portland and return, $35; New York and return, $32; Buffalo and return, 30. This is to meet the action of the Soo line in quoting these rates, which are about one-half the authorized rates.

All the different line cars of the Armour Company have been consolidated under the name of "Armour Car Lines."

Chairman Caldwell, of the Western Passenger Association, who is also chairman of the immigrant clearing house agreement, reports that the agreement is again working smoothly.

Indications are that the Eastern lines are keeping their new agreement pretty well, and that rates are being practically maintained on all east-bound traffic.

The Chicago, St. Paul, Minneapolis & Omaha has given notice that it will apply via Chicago all Summer tourist rates made by the Soo from St. Paul and Minneapolis to Eastern points.

The Wisconsin Central is complaining to the Western Passenger Association that its members are practically ignoring the identification clause of the agreement regarding mileage tickets, and accepting all tickets without question. It threatens to take retaliatory measures unless the practice is stopped.

The shipments of East-bound freight, not including live stock, from Chicago by all the lines for the week ending June 9 amounted to 53,867 tons, against 49,417 tons during the preceding week, an increase of 4,450 tons, and against 45,793 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to June 9.		W'k to June 2.	
	Tons.	P. c.	Tons.	P.c.
Michigan Central	4,914	9.1	4,068	8.2
Wabash	5,124	9.5	4,548	9.2
Lake Shore & Mich. South	7,764	14.4	6,368	12.9
Pitts., Ft. Wayne & Chicago	5,287	9.8	4,751	9.6
Pitts.,Cin.,Chicago & St.L.	7,046	13.0	6,402	13.0
Baltimore & Ohio	3,440	6.4	2,950	6.0
Chicago & Grand Trunk	6,033	11.2	5,750	11.6
New York, Chic. & St. Louis	5,598	10.5	5,244	10.8
Chicago & Erie	5.515	10.3	6,862	13.9
C. C. C. & St. Louis	3,146	5.8	2,374	4.8
Totals	53,867	100.0	49,417	100.0

Of the above shipments, 1,808 tons were flour, 2,657 tons grain and millstuffs, 9,023 tons cured meats, 11,126 tons dressed beef, 2,335 tons butter, 1,249 tons hides, and 5,815 tons lumber. The three Vanderbilt lines carried 34 per cent., the two Pennsylvania lines 22.8 per cent., Lake lines carried 57,144 tons, against 35,849 tons last week.

Other Chicago traffic news will be found on page 430.